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# FOOD MANUFACTURE

**Vol. XXVII. No. 10 · Published Monthly · October 1, 1952**

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**"it's a bit lumpy Mr. Cornthwaite"**

In the early days when the pestle and mortar were the only means of beating up a particular mixture, life didn't run too smoothly. In the modern idiom they were both full of " large lumps "! But people weren't so finicky then . . . much was to happen in scientific research and engineering advancements before it became possible to whip up a paste so smooth that even the man behind the microscope said " that's *fine* "!
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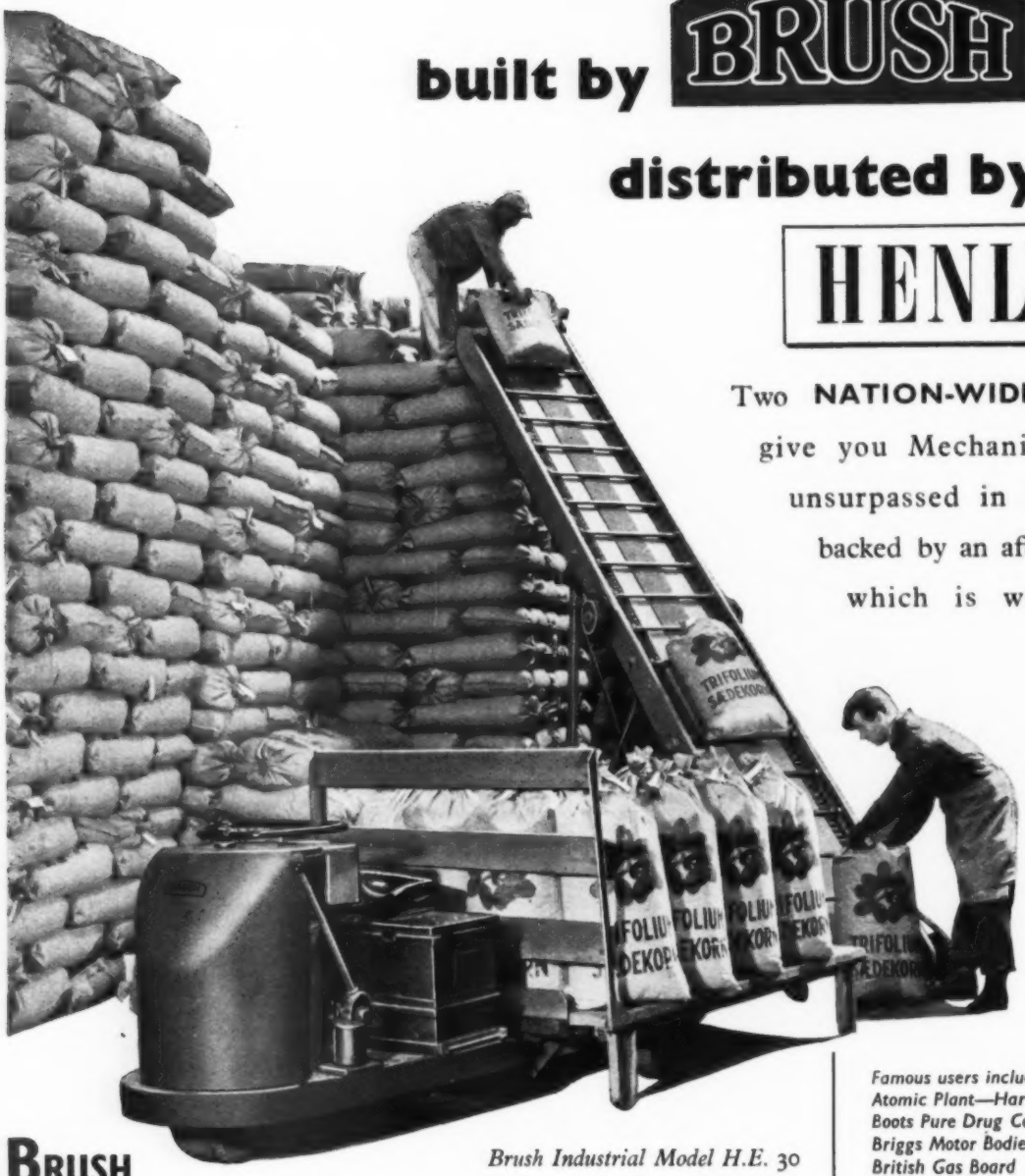

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FOOD MANUFACTURE

Vol. XXVII, No. 10 October 1, 1952

## *Britain's Food Supplies*

IN the course of his address to the British Association for the Advancement of Science, Dr. N. C. Wright discussed Britain's future food requirements and the extent to which British agriculture may be called upon to meet them.

Three factors, said the speaker, will govern the total level of demand for food; the first concerns the growth in population.

In the decade between 1939 and 1950 food had to be provided for an additional two and a half million mouths. The rate of population growth is slowing up. Nevertheless, over the next 20 years an increase of a further 5 per cent. is still forecast, adding another full two millions to the claims on our supplies. Secondly, there are the factors of the extent and pattern of demand. It seems unlikely that, on a *per caput* basis, the former will fall below the pre-war level. As regards the latter, it is noticeable that the trend in the national demand for food is already showing a return towards the pre-war pattern, and although it may be possible to vary slightly the choice within individual classes of food, it is doubtful if the population would, unless from dire necessity, contemplate with complacency a permanent change in general pattern of the type necessitated in the mid-war years.

There is evidence that the demand for the more nutritious, palatable, and attractive foods may in the future show a tendency to rise. Before the war, dietary surveys indicated that there were marked differences in food consumption levels between different income groups within the population. By 1950 these differences had either been eliminated or markedly narrowed.

It is true that the levelling of consumption in the war and post-war years can be attributed, in part at least, to measures specifically adopted to ensure an equitable distribution of supplies, based primarily on physiological needs—notably by rationing, subsidies, and welfare measures. Nevertheless, the greater equalisation of incomes probably exerted the major effect. If so (and provided Welfare measures are maintained) this changed consumption pattern might well influence future levels of demand if foods were once again in free supply.

It is here that the third factor will tend to operate—the future price of food. If consumption is to be maintained at both higher and physiologically more equitable levels, it is clear that the costs of production of home supplies (and equally, of course, the costs of procurement of overseas supplies) must be such as will furnish food at prices within the purchasing power of the mass of the population. This emphasises the importance of developing agricultural techniques which will be capable not only of increasing but also of cheapening food production.

With regard to the availability of world supplies from overseas, the greatly increased demands caused by the immediate post-war needs of liberated Europe and the Far East have eased, but long-term tendencies may take their place. World population grows at a rate equivalent to 10 per cent. per decade.

Thus we may in the long term not merely find valuable pre-war sources of supply no longer open to us (oilseeds from India are a case in point), but we may well be faced with increasing competition for the food surpluses of the primary producing countries.

Again, the availability of currency is not proving to be a merely short term problem, or merely one of dollar shortage. We are faced with an increasingly serious balance of payments problem, which will inevitably tend to limit our capacity to purchase supplies from overseas.

With potentially increasing home demand (provided reasonable prices are maintained) and a potentially contracting availability of world supplies, the need for further home production is assured. Whether this will once again involve us in a sparser or a plainer diet cannot be forecast. It would, indeed, be idle to predict how far our present output could, if need be, be expanded, or to speculate upon its future form. But even within the present general pattern of land usage, the application of science still offers ample scope for betterment. Crop yields on neighbouring farms still show too wide a gap, plant and animal disease still take too great a toll, methods of breeding and of feeding still vary too greatly in efficiency and skill. In some ten or twenty years, it may be possible to judge whether, within whatever pattern British agriculture has by then assumed, the industry has maintained its present march of progress, and whether science, the handmaiden of practice, has continued to fulfil her rightful and her beneficial role.

## *Food from Queensland*

ACCORDING to Press reports from Queensland at the time of this writing, Sir Donald Perrott, chairman of the Queensland-British Food Corporation, has hinted at radical changes in the structure of the Corporation's venture in Central Queensland. Earlier in the year, the Board of the Corporation appointed an advisory body to consider and make recommendations on its future objectives. Submissions had been made to the two Governments following the Board's consideration of the advisory body's report, which included some far-reaching recommendations.

The Corporation's £2,500,000 project was intended to produce food for Britain. Since its first crop in the 1948-49 season, it has disclosed a monetary loss of A£568,300.

The British Food Corporation's 1952 sorghum harvest was the worst ever, according to figures given by Sir Donald Perrott. The total harvest was about 320,000 bushels from 62,800 acres, including 9,400 acres replanted. This gives a yield of about five bushels an acre. The previous season's acreage of 43,700 produced 340,000 bushels plus 90,000 bushels of ratoon — overall an average yield of around eight bushels.

In the fourth annual report for 1950-51, it was stated that at current selling prices and production costs the Corporation would need an average thirteen bushel yield from a yearly planting of 60,000 acres to break even.

## *Vacuum Treatment of Fish for Canning*

THE application of vacuum in the pre-treatment of some kinds of fish for canning appears to have important advantages and to be commercially applicable, judging from the investigations made at the Pacific Fisheries Experimental Station at Vancouver.

The procedure consists of pre-cooking the fish, after which it is placed in unsealed cans or on trays and subjected to a vacuum in a retort. The effect is the almost instantaneous evaporation of part of the water in the fish; at the same time rapid cooling takes place. The evaporation and cooling are in no way dependent on heat conductivity and are limited in speed only by the rate at which the vacuum can be produced.

In one experiment, the fish, with an initial moisture content of 75 per cent., was steamed for 30 minutes at 212°F., during which it lost 15 per cent. of its weight. The vacuum was then applied and after 10 minutes the fish, at 140°F., had lost another 5 per cent. After the application of vacuum for a further 10 minutes, the fish, which had now been cooled down to 60°F., contained 75 per cent. of its original weight, *i.e.* it had lost a total of 25 per cent. of water.

By this simple means, it is possible to achieve the reduced moisture content required for sardine-type packs, to remove certain characteristic odours, and (in the case of tuna) to cool the fish very rapidly for the further steps in processing before canning.

Investigations made into the industrial application of the process indicate that the most suitable equipment for use in the cannery would consist of a barometric condenser and steam-jet ejectors connected to several cannery retorts. The retorts, which would be evacuated in succession when used in this way, would still be available for the customary pressure retorting at all times. An installation connected with three "3-car" retorts could be used to pretreat about 1,000 cases of 48 one pound cans each per eight hour day. It would require 125 gallons per minute of cooling water and 410 lb. of steam per hour. Equipment of this size would serve about 10 retorts for tuna canning and cool the fish in 20 minutes.

## *Bacon Prices—A Danish View*

A NEW contract between the Ministry of Food and the Danish bacon producers was announced on August 27, under which the Danes have agreed to a reduction in price. Negotiations had opened in London earlier in the month but agreement was not reached until they were resumed in Denmark.

The new price of 252s. 6d. per cwt. f.o.b. represents a drop of about 8 per cent. on the average price for the current year ending September 30. This was 262s. 5d. per cwt. up to 110,000 tons and 300s. per cwt. for deliveries in excess of that figure.

The expiring contract was made in 1948 when Denmark undertook to supply 90 per cent. of her total bacon exports to September 30, 1952, subject to an annual price agreement which allowed for a negotiated rise or fall in price not exceeding 7½ per cent.

The price agreed for 1948-49 was 225s. per cwt. f.o.b. This was reduced to 217s. per cwt. for the following year, 1949-50. A serious drop in pig production ensued, which is to be seen in the July, 1951 census figures, when the number of sows dropped to 340,000 compared with 401,000 the previous year, 11,000 more than in 1939. Increased prices were obtained later, and supplies have improved accordingly.

The new contract is for two years, and Britain will continue to take 90 per cent. of Denmark's total production. The negotiable variation in price up or down in the second year will be 10 per cent. instead of 7½ per cent.

When the negotiators first met in London the Ministry of Food asked for such a substantial reduction in price that the Danes returned to Denmark to report to their organisations. A statement was issued in Copenhagen after a meeting on August 19, in

which surprise was expressed that the British side had asked for a reduction in the price of bacon in spite of the higher costs of production and the considerable increases in meat prices granted to other countries.

It was clear that the Danish producers could not entertain as grave a cut as the Ministry of Food proposed. Negotiations were resumed in Copenhagen, and the agreement announced on August 27 was reached.

This agreement is not entirely satisfactory to the Danes as it was hoped that the price would at least be maintained at the existing level. A Danish spokesman in London, commenting on the agreement, told FOOD MANUFACTURE that: "The Danish producers are naturally disappointed. It is hard to be given a special incentive to increase production and to do it so successfully that you find yourself with a reduced price. This reduction in price will inevitably cause farmers to reduce pig production. This means less Danish bacon, though it will take a little time to show itself. It is not easy to go into reverse in any form of stock production—either up or down.

"We realise, of course, that it is really the remarkable expansion in British pig production in the past year or two that put the Ministry of Food in a very strong bargaining position. Thanks to the very good prices (by Danish standards) British pig production reached a record height over the same period as we have been increasing production. This has obviously been a considerable factor in the negotiations.

"Is it possible that British producers may have to take a reduction at the next annual Price Review?"

## *Controlling Fermentation in Cider*

THE influence of nitrogen and accessory growth factors on the stability of centrifuged ciders is the subject of a paper by L. F. Burroughs presented in the 1951 report of the Long Ashton Agricultural and Horticultural Research Station.

The utilisation of soluble nitrogen during fermentation of Bramley's Seedling juice has been investigated in three successive years, in two of which data for soluble phosphorus have also been obtained. The general course of the growth of yeast and of its subsequent autolysis has shown fundamental similarities in all three juices, although certain difference of detail and quantitative differences in the changes involved have been observed.

In the study of the undisturbed fermentation of the latest experiment, the most outstanding feature was found to be that all the soluble phosphorus utilised for yeast growth was liberated into the cider during six months' standing on the lees. This indicates that the amount of phosphorus in the lees at the end of this time was negligible and consequently either that autolysis of the yeast was virtually complete, or that the phosphorus content of any viable cells remaining was within the limits of experimental error.

After centrifuging, all ciders were relatively stable during storage with one exception, and in this case consideration of the soluble nitrogen data showed that yeast growth at the time of centrifuging was less complete in this particular sample of cider than in the others. This fact, together with the greater tendency of this cider to ferment, supports previous observations that the stability of a centrifuged cider is related directly to the extent of yeast growth prior to centrifuging.

By the addition of different combinations of yeast nutrients to one of the centrifuged ciders it was shown that its stability was due to deficiency of both nitrogen and aneurin and it is reasonable to suppose that the same deficiencies were operative in ciders centrifuged at later stages in the fermentation.

## *Fluoridised Salt?*

COMMENT was made in the July issue of *Manufacturing Chemist* on the steadily increasing practice of adding fluorides to public water supplies. This has been followed up in the August issue by mention of some new research, so far confined to animal tests, which has indicated an alternative method of providing fluoride for dental protection; this consists of the addition of soluble fluorides to salt destined for domestic purposes.

It has been found that fluoridised salt prevented caries and enamel weakening in young pigs fed on a high sugar diet. The next stage in this research, to be conducted at the Medical Centre of the University of California by Dr. Gunnar Santesson, a visiting Swedish scientist, will deal with human subjects.

The availability of fluoridised salt renders optional the ingestion of fluoride, whereas if the water supply of a whole town is treated, its inhabitants have no option but to absorb the substance. Apart from the risk of overdosage with fluorides which might happen to heavy drinkers of water, there remains the doubt as to the ultimate effects of fluorides on the human body, expressed by opponents of the scheme.

A similar scheme was mooted in 1950 when there was a suggestion that all salt supplied by retail sale would be compulsorily treated with a trace of iodine (FOOD MANUFACTURE, **25**, 5, 199). This has not as yet been implemented and on July 29, in the House of Commons, Mr. Viant asked the Minister of Food whether, when considering the recommendation of the Medical Research Council for the addition of iodine to all salt for human consumption, he would bear in mind the fact that large numbers of the public strongly objected to such addition and whether he

would give an undertaking that some uniodised salt would always be available to the general public. The Minister replied that he was aware of the objections but said it would be premature to give any undertaking before he had had the opportunity of considering the recommendations of the Food Standards Committee who are now considering representations following the publication of their report. As this report was published early in 1950, it would appear that the authorities are treading cautiously.

On the whole we deprecate the wholesale medication of the population *via* common articles of diet. Our imagination boggles at the terrifying number of "traces" which might be added to them, the complications of such additions, and the enormous amount of work that would be involved in the analytical control of the necessary standards.

## *The Labelling of Food*

A RECENT criticism of the Labelling of Food Order is that although it requires the statement of ingredients to be both "conspicuous" and "true," it does not go far enough. In some cases, ingredients are listed in minute type and in others they appear on separate labels which may be placed where they are likely to pass unnoticed.

In his 1951 report, Mr. J. Lawson, Manchester City Council's chief sanitary inspector, makes the suggestion that the Order might be amended to govern the position and minimum size of the statement relating to ingredients; better still, the size of the print rather than the size of the statement itself could be controlled.

Doubtless there would be difficulties in drafting a suitable amendment; nevertheless, the suggestion put forward is one that might well receive official consideration.

## *Ionising Radiations and Food*

WHEN ionising radiations are used to sterilise foods and tissues, side effects are produced that cause changes in their flavour, colour, and sometimes in their texture. Irradiation of these materials in inert atmospheres or *in vacuo*, especially when they are frozen, minimises but does not prevent such changes.

A biochemical approach having potentialities for the prevention of off-flavour and other undesirable chemical changes in foods and tissues has been described by Bernard E. Proctor *et al.* (*Food Tech.*, **6**, 7, 1952) which is based on a theoretical analysis of the radiochemical phenomena occurring in the reaction of ionising radiations with water and on experimental data obtained in cathode-ray studies with certain compounds in aqueous solutions.

The undesirable effects resulting from radiation sterilisation are ascribable to free radicals produced in the reaction of ionising radiations with water. These effects can be reduced or prevented by the use of free-radical acceptors, which protect the solute (flavour molecule or nutrient) by competing for the free radicals.

That the mechanism of protection is not simply an oxidation-reduction effect is amply illustrated by the results obtained when niacin was used as the free-radical acceptor, niacin being resistant to oxidation.

Observations were made with the enzyme pepsin, the amino acid histidine.HCl, suspensions of red blood cells, and samples of chopped (cured) meat products. It was demonstrated that ascorbic acid and its derivatives (D-isoascorbic acid and sodium D-isoascorbate), niacin, and sodium sulphite, designated as free-radical acceptors, all had a protective action when combined with one or the other of the solutes.

Haemolysis of red blood cells *in vitro* at sterilising doses of radiation was prevented, and the colour, flavour, texture, and odour of chopped meat products remained unchanged when they were irradiated in the presence of a free-radical acceptor.

## *More Shortages*

No matter what commodity comes up in our reading, there is sure to be a shortage of it somewhere. When those Greenland explorers decided to take biltong in place of the pemmican expected from the schoolboy thrillers, were there available any strips of lean buffalo or antelope meat dried in the sun? No, there were not, although Rhodesia House in the Strand sent out belated urgent calls. It seems the tsetse fly-ridden shooting areas could get no biltong ready at such short notice; but fortunately there came supplies by Comet from a far-away Gwanda ranch—which was as good an ending to the story as any schoolboy could wish. "Salty, flaky, and always palatable" is the reason for preferring bil(buttock) tong(tongue), it is stated.

Then a shortage of bones! Not of those few wrapped in newspaper for the dog, but bones by the ton for bonemeal to lure wild elephants into a longer seasonal stay in the Addo game reserve of South Africa. Tourists stay at Port Elizabeth for the orange and citrus harvesting, and then move on for lack of further entertainment. Only wild elephants will hold them, and these won't function unless bonemeal porridge is available.

A third item is the threat of a castor oil shortage—with America having to import from Brazil. Castor oil is needed for typewriter ribbons, pliable leather, hydraulic fluids for big guns, and for lubricating jet engines, not to mention the time-honoured potion for our hapless progeny as an antidote for their summer holiday's gorging. 80,000 acres of castor bean planting will have to be done, unless we can conjure a new version of Jack and the Beanstalk.

# Chocolate in Switzerland

**Established more than 50 years ago, the Nestlé chocolate factory at Broc is situated in the beautiful surroundings of the famous Gruyère dairy district. Up to 1,000 people work there, producing the many varieties of slab and fancy chocolates sold under the names of Nestlé, Peter, Cailler, and Kohler.**

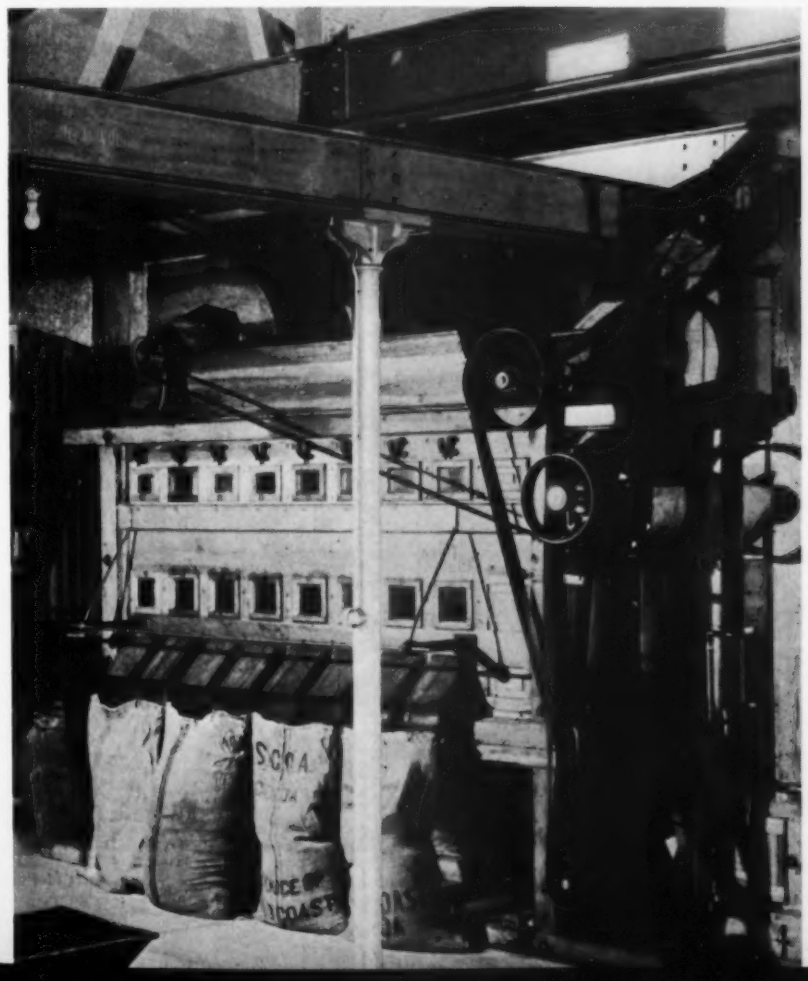
UNTIL the end of the 18th century, chocolate was made entirely by hand; it was not until 1819 that the first machine was made available to the industry. Dating from about 1800, the Swiss chocolate industry has progressed to such an extent that today it contributes generously to the country's national economy.

The beans are subjected to a cleaning and sorting operation.

### Treatment of Cocoa Beans

The manufacture of chocolate at the Broc factory follows the usual stages of cleaning, roasting, winnowing, mixing, refining, conching, moulding, demoulding, wrapping, and packing.

On their arrival at the factory, the cocoa beans are subjected to a cleaning and sorting operation which is carried out in equipment that not only cleans the beans, but also grades them according to their size—an essential condition for uniform roasting.



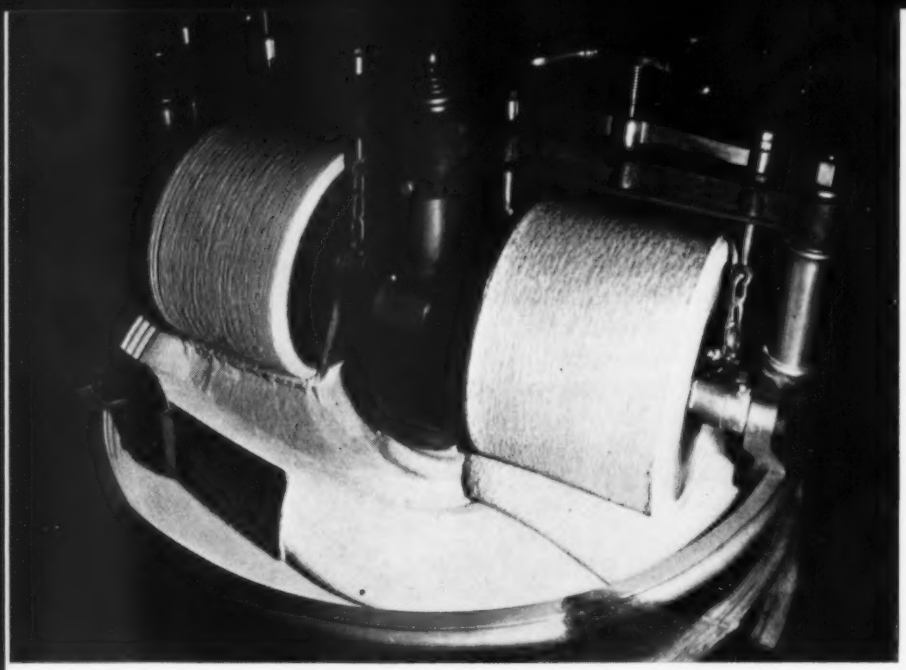
After roasting, the beans pass through a winnowing machine.

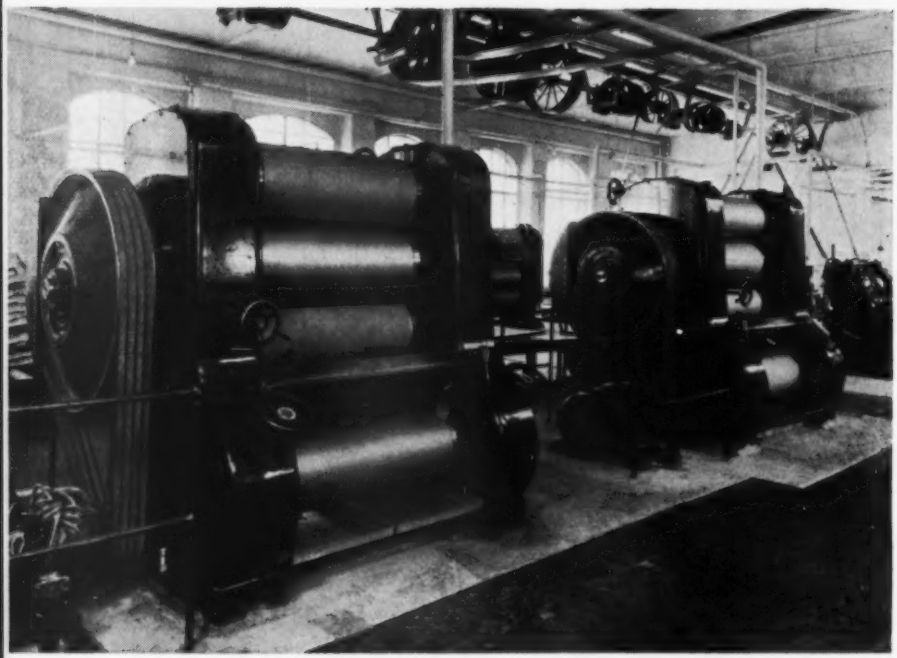
After cleaning and roasting, the cocoa beans are cooled and passed through a winnowing machine for the removal of husks, the roasted beans emerging in the form of clean nibs, classified according to size. .

### Manufacturing Operations

For the manufacture of chocolate and chocolate coating, the cocoa (in solid form or already milled) is mixed with sugar and cocoa butter, which gives the required mixture for further processing. Milk chocolate is obtained by adding dried milk in powder or block form to cocoa, sugar, and cocoa butter. Where condensed milk is used in place of the powdered product, it is first dried.

As the chocolate mass emerges from the *mélangeur*, it is subjected to a refining operation and





is then passed through the conching machines in which the chocolate mass is subjected to further heat treatment, combined with vigorous and continuous stirring.

Once this operation has been completed, the chocolate paste is brought to the desired moulding temperature by means of tempering machines. The mass is then deposited in metal moulds by means of chocolate depositors, the moulds being shaken in order to eliminate air bubbles. They are then passed through a cooler which solidifies the chocolate ready for demoulding and wrapping.

**Wrapping Methods**

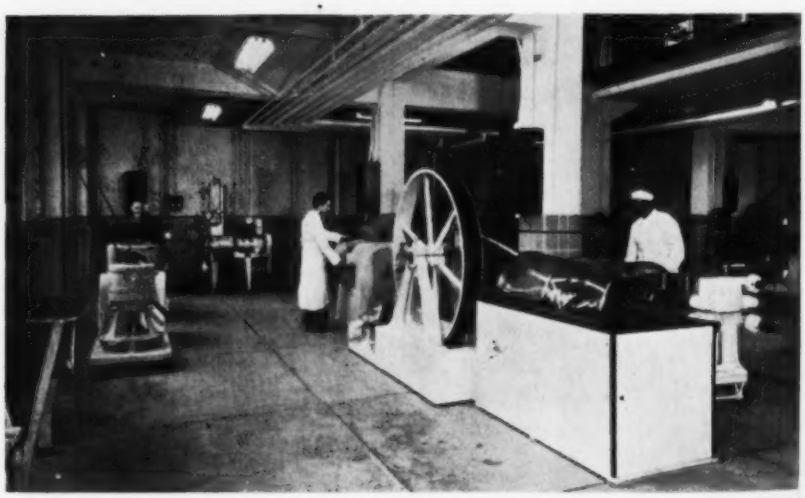
Particular emphasis is placed on the wrapping methods adopted by the Nestlé organisation. The first step towards modern packaging began when the chocolate was moulded into rectangular half-pound bars instead of large blocks that had to be broken up by the retailer. These pieces of regular shape could then be easily wrapped. Gradually the varied range of wrappings for Nestlé's chocolate was created, among which was the bright red wrapper with gold lettering which has become world famous.

In the course of its journey from moulding machine to consumer, the chocolate is subjected to many dangers. For example, following the moulding operation the temperature of the chocolate is low. If the atmosphere is humid, a light dew may settle on it and cause irreparable damage. During the wrapping operations, a

*Top left:* **Chocolate and sweetened coating are made by thoroughly mixing cocoa, in solid form, or already milled, with sugar which, in some cases, has already been finely ground to facilitate subsequent operations, and with cocoa butter which gives the mixture the consistency required for further processing. The mixing operation is carried out in " mélangeurs."**

*Above:* **After passing through the "mélangeurs " the chocolate mass is refined, the cylinders of the refiners being closed or opened in order to obtain the degree of fineness required.**

*Right:* **In the pilot plant at La Tour de Peilz is a single-bed conche (in the foreground) which imparts the final degree of smoothness to the chocolate prior to moulding and wrapping.**



In the conches, the chocolate mass is subjected to a heat treatment, combined with vigorous and continuous stirring.

Once conched, the chocolate is brought to the desired moulding temperature and deposited in metal moulds.

worker may leave her fingermarks on it. Even the slightest contact or friction with another bar will mark it. The chocolate may be attacked by pests or, if stored with other products, it may absorb their odour. Moreover, if the storage room is damp, the bar quickly develops moulds and similar organisms.

Many of these dangers have been rendered harmless by the methods adopted by the company. To eliminate condensation through excessive humidity, air conditioning equipment has been installed in both the manufacturing plant and storage depots, where strict control is maintained.

The paste from which chocolate is made is handled automatically and modern packaging equipment protects the tablets from being marred by fingermarks, and from contact with other tablets. The

An adjustable automatic wrapping machine.

Inside the pilot plant, which is housed in the research and control laboratories.

wrapping machinery used in the factory is capable of a high degree of precision, and wrapping speeds exceed 100 chocolate bars or 300 small chocolate pieces per minute.

A recent development is the introduction of the use of aluminium foil having a thermoplastic coating, the foil being heat-sealed along the entire edge of the tablet. Tests are also being carried out with another type of wrapper made of a special paper which is completely insect-proof.

**Research and Control**

The central research and control laboratories of the organisation at La Tour de Peilz were inaugurated in 1950, their main function being the control of the quality of all the chocolate and other foods produced in the 129 Nestlé factories throughout the world. To perform this considerable task, the laboratories check upwards of 36,000 samples each year.

In the research section of the building, the creation of new products and the task of improving those already in being are undertaken. Among the facilities at its disposal is a central library housing upwards of 10,000 volumes devoted to chemistry and biology, and some 220 scientific periodicals.

Adjoining the laboratory block is a pilot plant equipped with miniature working models of all the machines used in the actual factories. These include a condensery, an extraction plant for making *Nescafé*, spray driers, drum and vacuum driers, a pasteuriser, evaporators, a steriliser, centrifuges, kneading troughs, grinding mills, etc.

These new laboratories will add the great weight of their technical and scientific assistance in keeping the company in the vanguard of progress in the food industry and will contribute, to a large extent, in upholding the uniformly high quality associated with the products of this organisation.

The analytical control laboratory. *Photos Afico S.A.*

## New Books Register

*Orders for any of the books listed below, or scientific and technical books in any language, may be placed with the Books Department,* FOOD MANUFACTURE, *Stratford House, 9, Eden Street, London, N.W.1. A selected stock of books is carried and may be inspected at the above address. Prices given do not include postage.*

Bate-Smith, E. C., and Morris, T. N. (Ed.). *Food Science.* Cambridge University Press. Pp. 320. 16 plates. 46 figures. 40s.

Campbell, Colin and Herbert, J. M. B. *Laboratory Tables for Qualitative Analysis.* Manchester University Press. Pp. 17. 4s. 6d.

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# Lecithin in Food Processing

**Part IV**

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**The use of commercial lecithin in cereal products has been reviewed in Parts II and III of this series. This concluding article gives an outline of the application of phosphatides in other sections of the food industries, notably in the production of chocolate and sugar confectionery, ice cream, and edible fats.**

THE surface-active properties of lecithin, which have led to the use of phosphatides in the preparation and stabilisation of oil-water emulsions, have also been utilised to promote the formation of uniform and stable dispersions of solids in oils.

It is for this reason that lecithin has been extensively used in chocolate manufacture, an important part of chocolate processing being the formation of an intimate mixture of cacao material, sugar, and other solid constituents with cocoa butter and other fats. This mixing process is carried out in several stages depending on the end in view, but the qualities of the final product, whether it is to be sold as chocolate or used as a couverture, are related to the degree of dispersion of the components.

### Uniform Dispersions

Some of the effects brought about by phosphatide supplements at different stages in chocolate processing are shown in Table 1. In the mixing process lecithin acts as an "inter-surface modifier," probably through the formation of mono-molecular films coating the solid particles and bringing them into union with the fatty medium. The increase in uniformity of the lecithin-containing products can be shown by microscopic examination, and is evident from micro-photographs.

For the establishment of these surface films a relatively small percentage of lecithin is effective; somewhat larger quantities are required to produce other effects, such as a decrease in viscosity.

The stability of lecithin-containing chocolate is reflected in its resistance to changes during processing (for example in melting, heating, and agitation) and in ageing. Thus the product can be heated over a wider range of temperature without a breakdown of the dispersion and a precipitation of the solid constituents, a matter of special importance in chocolate containing a high level of milk solids.[27] This increased stability to heat treatment is analogous to the "protective action" of lecithin and other surface-active agents in simple solid-water colloidal systems.

### Reduction of Viscosity

In the processing of chocolate for various purposes it is necessary to obtain material of the correct degree of fluidity, and this is especially important in the preparation of chocolate to be used as couvertures. Thus considerable attention has been given to viscosity determinations and the ways and means by which the viscosity of a product can be standardised and controlled. Clearly the "covering power" of a given weight of molten chocolate will depend partly on the viscosity of the mixture; the formation of layers of constant thickness will be contingent on the maintenance of constant viscosity of the chocolate fluid.

Within certain limits the viscosity of chocolate may be reduced by the addition of increasing amounts of cocoa butter, and this is the normal method adopted in industrial practice.

The use of commercial lecithin as a supplement to cocoa butter has been accepted by the industry following the investigations of Working,[28] Avent,[29] Morgan,[30] and others who have studied the effects of lecithin on chocolate-cocoa butter systems. Thus Avent and Morgan[31] demonstrated that a progressive lowering of viscosity took place with the addition of phosphatide, the maximum effect being achieved with 0·5 per cent. lecithin. Cook[32, 33] found that 0·3 per cent. lecithin was sufficient to reduce the viscosity by 50 per cent., and Stanley[34] showed that 0·35 per cent. lecithin had the same effect in viscosity reduction as 8 per cent. of cocoa butter.

It was pointed out by Working[28] that lecithin could be used to replace part of the cocoa butter required for chocolate processing in that, with suitable lecithin supplements, a product could be obtained of the same viscosity but with a lower (by 30 to 35 per cent.) cocoa butter content. Stanley[34] came to the conclusion that a saving of 20 per cent. of the cocoa butter content could often be effected, with a consequent re-

TABLE 1

USE OF PHOSPHATIDES IN CHOCOLATE MANUFACTURE

| *Stage* | *Effects of added phosphatides* |
|---|---|
| *Processing.*—Grinding of: | |
| (*a*) solids — cacao material, sugar—with | (1) Ready "wetting" of ingredients to give<br>(2) Decrease in time and effort in grinding and<br>(3) More even distribution of constituents with<br>(4) Consequent increase in stability. |
| (*b*) cocoa butter | |
| Heat treatment. — Tempering, etc. | (5) Product more resistant to the effects of overheating and can be processed over a wider temperature range. |
| Preparation of couverture for enrobing, etc. | (6) Changes in physical properties, especially reduction in viscosity of chocolate—cocoa butter mixtures leading to<br>(7) Possibility of reducing cocoa butter content. |
| *Final product.*—Stability and keeping qualities | (8) Product more resistant to changes brought about by absorption of moisture<br>(9) Separation of constituents (leading to "fat bloom") retarded. |

duction in the cost of production.

The optimum amount of lecithin required will vary with the chocolate being processed and with the end in view.

#### Resistance to Moisture

An important problem in chocolate processing is that produced by the absorption of water resulting in a thickening which can be measured by an increase in viscosity. Langwill[35] pointed out that lecithin would protect chocolate from the effects of imbibition of water vapour, and Stanley[36] reached the same conclusion by carefully controlled experiments in which he compared two samples of chocolate both of the same initial viscosity (112 degrees MacMichael) and of the same moisture content (0·50 per cent.). As the moisture content was progressively increased (up to 2 per cent.), the first sample (containing 0·3 per cent. lecithin) gave uniformly lower viscosities than the second (containing 6 per cent. of added cocoa butter). In this connexion the observations of Erb and Collins[37] are of interest; they showed that the full effect of phosphatides in chocolate are exerted only when a small percentage of moisture is present.

#### Stability of Final Product

A well-known difficulty arising in chocolate production is the deterioration known as "blooming" or "greying"—caused by the deposition of fat ("fat bloom") or sugar ("sugar bloom") in the form of scattered patches or thin films of greyish material on the surface leading to the disappearance of the gloss. The fault may extend into the body of the product and give texture of poor appearance.

Various workers have claimed that the presence of lecithin will counteract the tendency to bloom formation although Clayton and his colleagues[38] suggest that the contribution of the phosphatides is small, and recent investigators[39] have recommended the use of some of the newer surface-active agents. It is clear that irrespective of the possible role of lecithin, adequate control of tempering and other stages of processing is very important.

#### Amounts of Lecithin Supplements

Cook[32] has drawn attention to the necessity for controlling carefully both the amount of lecithin and the method of its addition to chocolate, and has pointed out that if the lecithin is added prior to or during refining and conching, a considerable reduction in the activity of lecithin may occur, particularly because of the heat generated. As already indicated there are advantages in using lecithin at an early stage, but if the aim is to obtain a maximum effect on viscosity, more lecithin must be added later. He recommends the use of about 0·25 to 0·3 per cent. lecithin to achieve minimum viscosity and further quantities if the chocolate is likely to come into contact with moisture—as in the production of chocolate covered ice cream bars.

#### Confectionery and Ice Cream

The use of commercial lecithin in the production of various types of sugar confectionery has been investigated by Jordan[40] and by others,[33] who have shown that lecithin is particularly effective in the preparation of fat-containing products, such as caramels and nougats. As an emulsifying agent (in amounts of the order of 1 per cent. in relation to fat) it aids in the mixing processes bringing about a rapid distribution of the fat in the water-soluble ingredients, such as sugar, syrup, or milk. It also retards the separation of the components on cooking and the consequent deterioration of the texture (graining) and surface of the product.

Stanley[27] has described further uses of phosphatides in relation to sugar confectionery, namely as a carrier and fixative for volatile flavours, and for water soluble colours.

Ice cream is a complex physico-chemical system consisting of butter or other fats, milk solids, sugar, and other ingredients. It has long been known that certain substances (such as eggs or gelatine) with colloidal properties must be added to the ice cream mix in certain minimum amounts if a stable product of smooth texture is to be obtained (*cf.* Clayton[41] p. 261). In the absence of such stabilisers, the ice cream is gritty, or becomes so on standing, because of the formation of lactose crystals, or—in some cases—of ice crystals.

A number of investigations on the use of phosphatides in ice cream manufacture have shown that lecithin will ensure a better distribution of the fat in the mix and will retard the onset of "sandiness" in stored products, even in those prepared with relatively high concentrations of milk solids, *i.e.* with a high lactose content. Thus it is claimed that lecithin will produce a smoother product and that it can in part replace egg yolk.

The advantages of lecithin have been discussed by Stanley[42] and by other workers,[43, 44] and have been the subject of patent claims.[45, 46] Cook[32] has pointed out the importance of using lecithin in the right form—namely in aqueous dispersion—if full benefits are to be obtained. Other writers have considered the contribution of lecithin to sherbets and frozen desserts.

#### Edible Fats

As already noted commercial lecithin has been used in the manufacture of edible fats as an emulsifying agent to promote blending, and advantages have been claimed for lecithinated shortenings to be used as bakery, chocolate, and sugar confectionery ingredients. There is one important restriction that must be placed on the use of lecithinated oils—they cannot be used in processes which involve high temperatures for long periods, as in deep fat frying.[32] High temperatures bring about a decomposition of the phosphatide with a consequent darkening of the oil.

Margarine, a by-product of the Franco-Prussian War of 1870, gradually became accepted as a butter-substitute in Europe and in the United States. The earlier formulae involved the emulsification of milk and animal fats to give a water-in-oil dispersion.

Later, many different fats of animal or vegetable origin were utilised, cotton-seed oil and soya oil being important ingredients in the United States, and coconut oil, palm oil, and hydrogenated whale oil in Europe.

#### Emulsifying Agents

At an early stage it was demonstrated that one of the key problems was the production of an emulsion, comparable in stability to that which exists in good quality butter. In the absence of suitable emulsifying agents, syneresis occurs — the margarine "leaks" or "bleeds" during storage with the exudation of water from the emulsion. This separation of the oil and water phases is hastened by heat, and is especially evident when the margarine is used for frying; the steam generated from the liberated water causes the oil to spatter and a residue of milk protein and other solids adheres to the pan. Corresponding changes do not occur when butter is used for frying because of the emulsifying agents present in the natural product.

As early as 1884 egg yolk was introduced as an emulsifying agent in margarine manufacture; later egg yolk lecithin was used and from 1925 onwards[49] soya and other plant lecithins in amounts ranging from 0·1 to 0·5 per cent. fat. It is claimed that phosphatides facilitate the mixing process and ensure a more uniform distribution of the triglycerides and greater stability both during storage at ordinary temperatures and during processes such as frying.

In recent years (*cf.* Bailey,[47] p. 283) investigations have been carried out on the use of lecithin in combination with other emulsifiers, such as mono-glycerides, and it is said that the mono- and di-glycerides are effective as "anti-leaking" agents at low concentrations, but that they do not have the same anti-spattering action as the phosphatides.

#### Miscellaneous Products

In addition to the major uses of lecithin so far considered (cereal products; chocolate and sugar confectionery; ice cream and related products; edible fats—shortenings and margarine), a great number of other food uses have been suggested. These have been reviewed by Wittcoff,[18] and include proposals for the incorporation of phosphatides in such products as cocoa powder, dried soup preparations, cheese, sandwich spreads, peanut butter, mayonnaise, and chewing gum. Cook[32] gives helpful information regarding the optimum quantities of lecithin and the method of use in some of these products.

#### Phosphatides as Antioxidants

Many of the food uses of phosphatides can be forecast from, or traced back to, the surface-active properties of the molecules which enable them to act as emulsifying agents in aqueous-oil systems and as inter-surface modifiers or as protective agents in other colloid systems. Allied to these properties is the ability of phosphatides to form imbibitions with water and complexes with a wide variety of substances. On the basis of such considerations an explanation can be given of the role of phosphatides in such diverse products as bread doughs and chocolate-cocoa butter mixtures.

In a different category must be placed the many claims that commercial phosphatides can serve as antioxidants. This question was reviewed by Bibby[52] in 1945 and has been the subject of extensive investigations in many countries. Three aspects of the problem have received special attention: (i) Do the antioxidant properties arise from some one phosphatide, for example from the phosphatidyl choline (lecithin), or are they the result of non-phosphatide components present in commercial phosphatide preparations? (ii) What are the effects on the stability of different types of fats? (iii) Can the effects be carried through to the final product?

There would appear to be no doubt that under certain conditions phosphatides are effective in retarding the oxidative rancidity of certain animal and vegetable fats and the oxidative destruction of vitamin A and other substances. Thus work has been carried out on soya phosphatides[50] and on cotton-seed and maize,[51] groundnut,[52] and animal preparations.[53] The problem is complicated by the large number of possible substrates (lard and other animal fats and marine oils, vegetable fats of different types, vitamin A preparations) as well as by the complexity of the commercial phosphatide preparations, and hence there are many conflicting reports in the literature.

The effects of phosphatides in improving the colour and shelf life of biscuits have already been considered, and similar effects have been noted in other cereal products. Some of the precautions necessary for the scientific study of stability of cereal products have been outlined by Riemenschneider,[54] who has stressed the pro-oxidant action of traces of metals which may be present in the original ingredients or which may become incorporated during processing.

Recent investigations on antioxidants have shown the importance of synergistic effects, namely the ability of a combination of chemical substances to exercise a more powerful action than would be expected from the summation of their individual effects. Phosphatides have been successfully used as components of such (antioxidant) mixtures.

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*(Concluded on page 411)*

# Ministry of Food

## LATEST STATUTORY INSTRUMENTS

**The list given below is the continuation of the list of Instruments published in "Food Manufacture," July 1, 1952, page 268.**

### PRICE FIXATION

| No. | Date. 1952. | |
|---|---|---|
| 914 | May 8. | Order amending the Eggs (Great Britain) Order, 1951, and the Eggs (Northern Ireland) Order, 1951. Revokes S.I. 1952, No. 261. |
| 976 | ,, 18. | Order amending the Bread Order, 1951. |
| 978 | ,, 25. | Order amending the Tea (Prices) Order, 1948. Revokes S.I. 1951, No. 727. |
| 1067 | June 1. | Order amending the Sugar (Control and Maximum Prices) Order, 1947. Revokes S.I. 1951, No. 1209, and S.I. 1952, No. 282. |
| 1068 | ,, 1. | Order amending the Condensed Milk Order, 1951. Revokes S.I. 1952, No. 365. |
| 1069 | ,, 1. | Order amending the Cream Order, 1951. |
| 1102 | ,, 6. | Order amending the Invert Sugar Order, 1951. |
| 1103 | ,, 15. | Order amending the Syrup and Treacle Order, 1950. |
| 1112 | ,, 15. | Order amending the Rice Order, 1950. |
| 1122 | ,, 15. | The Meat (Prices) (Great Britain) Order, 1952. Revokes S.I. 1951, No. 1313. |
| 1123 | ,, 15. | The Meat (Prices) (Northern Ireland) Order, 1952. Revokes S.I. 1951, No. 1314. |
| 1124 | ,, 15. | The Meat Products (No. 2) Order, 1952. Revokes S.I. 1952, No. 507. |
| 1135 | ,, 12. | Order amending the Eggs (Great Britain) Order, 1951, and the Eggs (Northern Ireland) Order, 1951. |
| 1148 | ,, 15. | Order amending the Sugar (Control and Maximum Prices) Order, 1947. Revokes S.I. 1952, No. 1067. |
| 1203 | July 1. | The Feedingstuffs (Prices) Order, 1952. Revokes S.I. 1951, Nos. 494, 961, 1136, 1571, and 2037, and S.I. 1952, No. 759. |
| 1226 | ,, 1. | Order amending the Dredge Corn (Great Britain) Order, 1951, and the Dredge Corn (Northern Ireland) Order, 1951. Revokes S.I. 1951, Nos. 1573 and 2040. |
| 1227 | ,, 1. | The Barley Order, 1952. Revokes S.I. 1950, No. 1077, and S.I. 1951, Nos. 1117 and 1572. |
| 1228 | ,, 1. | The Rye Order, 1952. Revokes S.I. 1950. No. 1079, and S.I. 1951, No. 1121. |
| 1229 | ,, 1. | Order amending the Wheat (Great Britain) Order, 1951, and the Wheat (Northern Ireland) Order, 1951. Revokes S.I. 1951, Nos. 1575 and 2038. |
| 1230 | ,, 1. | The Oats (Great Britain) Order, 1952. Revokes S.I. 1950, No. 1074, and S.I. 1951, Nos. 1120, 1574, and 2039. |
| 1231 | ,, 1. | The Oats (Northern Ireland) Order, 1952. Revokes S.I. 1950, No. 1075, and S.I. 1951, Nos. 1120, 1574, and 2039. |
| 1238 | ,, 1. | Order amending the Milk (Control and Maximum Prices) (Northern Ireland) Order, 1951. Revokes S.I. 1951, No. 2066. |
| 1239 | ,, 1. | Order amending the Milk (Control and Maximum Prices) (Great Britain) Order, 1951. Revokes S.I. 1951, No. 2065, and S.I. 1952, No. 848. |
| 1261 | July 3. | Order amending the Eggs (Great Britain) Order, 1951, and the Eggs (Northern Ireland) Order, 1951. Revokes S.I. 1952, No. 914. |
| 1298 | ,, 12. | Order amending the Egg Products (Control and Maximum Prices) Order, 1946. |
| 1504 | Aug. 17. | Order amending the Chocolate, Sugar, Confectionery, and Cocoa Products Order, 1951. Revokes S.I. 1952, No. 211. |
| 1528 | ,, 24. | Order amending the Flour Order, 1952. |

### COFFEE

| | | |
|---|---|---|
| 1523 | Aug. 20. | Order revoking the Coffee Order, 1951. |

### DRIED FRUIT

| | | |
|---|---|---|
| 1461 | Aug. 31. | Order amending the Dried Fruits Order, 1951. |

### ICE CREAM

| | | |
|---|---|---|
| 815 | May 5. | Order amending the Ice Cream (Heat Treatment, etc.) Regulations, 1947. |
| 1283 | July 7. | Order amending the Food Standards (Ice Cream) Order, 1951. |

### POTATOES

| | | |
|---|---|---|
| 1389 | Aug. 1. | The Ware Potatoes Order, 1952. Revokes S.I. 1951, Nos. 1724 and 2169; and 1952, No. 31. |

### PUBLIC HEALTH

| | | |
|---|---|---|
| 1481 | Aug. 31. | The Public Health (Meat) (Amendment) Regulations, 1952. |

### RATIONING

| | | |
|---|---|---|
| 847 | May 1. | The Feedingstuffs (Rationing) (General Licence) Order, 1952. |
| 971 | ,, 18. | The Food Rationing (General Provisions) Order, 1952. |
| 972 | ,, 18. | The Bacon (Rationing) Order, 1952. |
| 973 | ,, 18. | The Meat (Rationing) Order, 1952. |
| 974 | ,, 18. | The Sugar (Rationing) Order, 1952. |
| 975 | ,, 18. | The Rationing (Personal Points) Order, 1952. |
| 977 | ,, 18. | The Fats, Cheese, and Tea (Rationing) Order, 1952. |
| 995 | ,, 21. | The Feedingstuffs (Rationing) (General Licence No. 2) Order, 1952. |
| 1121 | June 15. | Order amending the Meat (Rationing) Order, 1952. |
| 1329 | July 20. | Order amending the Meat (Rationing) Order, 1952. |
| 1434 | Aug. 3. | Order amending the Meat (Rationing) Order, 1952. Revokes S.I. 1952, No. 1329. |
| 1458 | ,, 10. | Order amending the Sugar (Rationing) Order, 1952. |
| 1459 | ,, 10. | Order amending the Fats, Cheese, and Tea (Rationing) Order, 1952. |
| 1507 | ,, 17. | Order amending the Meat (Rationing) Order, 1952. Revokes S.I. 1952, No. 1434. |

# Plum Drying in Kent

**In years of light or medium plum yields the crop can be fully absorbed by the fresh fruit trade, the jam manufacturers, and canners. In years of heavy yield, however, such as the present one, the usual outlets become saturated and the surplus has often been wasted. To avoid this, experiments on the drying of plums, as well as other English fruit, have been carried out at the Ditton Laboratory of the Food Investigation Organisation of the Department of Scientific and Industrial Research.**

THIS has been a glut season for plums and the results of the experiments on the drying of this fruit have been utilised with admirable promptitude by Foster Clark, of Maidstone, with the assistance of Dr. A. C. Hulme and Mr. G. Mann of the Ditton Laboratory.

The fact that something had to be done quickly if much of the plum crop were to be salvaged made impossible the installation of elaborate equipment. Some of the plant at the Maidstone factory is being used for the preliminary processing operations, but for the drying operations some improvisation was necessary. It was found that a certain type of grass drying plant would be suitable for the purpose and with the co-operation of Mr. R. A. Bowden, the farm manager at Park Farm, whose grass drier has been used throughout the present processing runs, a remarkable degree of success has been achieved.

Among the varieties recommended for drying by the Ditton Laboratory and tested at Park Farm, were the Czar, Bush, Pershore Purple Egg, and the Monarch. In addition the Belle de Louvain variety was experimented with, but in this case the drying time was too long to make their use economic.

#### Preliminary Lye Treatment

The preliminary stages in plum drying are carried out at the Maidstone factory, where the fruit, on arrival from the orchards, is dipped for 10 seconds into a 1 per cent. boiling caustic soda lye which ruptures the firm waxy skin.

After the lye-dipping, the fruit is immediately plunged into cold running water, washed thoroughly, drained, and spread on the drying trays, the mesh of which is made of expanded aluminium.

The trays are transported to Park Farm and placed in tiers, five high, in the grass drier for a period of time which varies between 12 and 24 hours, according to the variety of plum being dried, at a temperature ranging from 150° to 160°F.

After the drying operation, the plums are taken back to the factory, and left on the trays for one more day. The dried fruit is then put on to a conveyor belt, strigged, and inspected, any plums which are not properly dried being rejected. They are then bulked together in a holding bin for two weeks, at the end of which time they are examined, packed in 28 lb. outers, and despatched.

**Plums being dried at Park Farm.** *Photo "The Kent Messenger."*

#### Keeping Qualities

The shelf life of the dried plums is estimated at about 12 months when stored at 60°F. After this time, as has been found by the experiments conducted at the Ditton Laboratory, there is a tendency to be formed on the surface of the plum a white bloom which might be mistaken for mould, but is in fact the deposit of sugar, mainly fructose, which has no effect on the flavour of the product.

For cooking, the dried fruit is soaked for 12 to 16 hours in cold

water and then gently boiled and simmered in the soaking water for 30 to 40 minutes. Sugar is required for sweetening, using approximately 2½ to 3½ oz. to 8 oz. dry weight of plums.

To date, several tons of plums have been dried by the company, 1,000 lb. of plums yielding about 250 lb. of the dried product, and the company have already released supplies for retail sale in the Scottish and north of England markets.

There are, of course, many teething problems to be overcome before the drying of plums can become a really economic proposition. Difficulties being encountered at the moment are the high labour, transport, and fuel costs, although the latter item could be reduced were it possible to operate the drier on a continuous basis. Nevertheless, the company and Mr. J. W. Hobday are to be congratulated on their efforts to save a large proportion of this year's plum crop from going to waste.

## Plant and Fuel Efficiency

SOME 400 members representing plant engineers in many fields attended the fifth annual conference of the Incorporated Plant Engineers at Harrogate.

At the annual general meeting, Mr. G. A. Rooley, A.M.I.Mech.E., was installed as sixth President in succession to Mr. D. Lacy-Hulbert. In his Presidential address, he contended that there was a need for an industrial revival, and outlined the part to be played by the plant engineer. He was responsible for something approaching 20 per cent. of the cost of processing and, for that reason, it was very important that he and the administration should work closely together.

In the first paper, "The Works Engineer," Mr. D. Holland (chief works engineer of Serck Radiators) said that although he had made no mention of specialised plant, his remarks would no doubt serve to illustrate how very wide was the scope of the works engineer. He went on to describe the various functions the works engineer performed, not only in his technical capacity, but also in handling men. Although his responsibilities were heavy, his profession offered variety and interest, and afforded the opportunity for gaining knowledge in many crafts. In the discussion that followed, Mr. Holland dealt further with the relation of the layout of plant and the building in which it was installed.

"Civil Engineering—The Programme and the Plant" was the subject of a paper by Mr. Arnold Whittick (editor of *The Muck Shifter and Public Works Digest*). He concentrated his remarks mainly on Great Britain with occasional glances at work in the Dominions and Colonies. Among the sections covered were communications and transport, including road, railway, dock, and harbour construction, and inland waterways; agriculture, irrigation, drainage, flood and coast protection, and reclamation; water supply; hydro-electric schemes, including the construction of dams, tunnels, reservoirs, aqueducts, and pipelines; and open-cast iron ore and open-cast coal.

In the discussion that followed, Mr. Whittick dealt further with the possibilities of the use of aircraft in civil engineering. He pointed out that the tendency was more and more towards the use of large precast sections and less site work. As this would involve the transport of such large sections, he suggested it might best be done in the future by hover planes.

To complete the technical session, three discussion groups considered "Fuel and Power," the discussion being led by Mr. J. C. Veale (chairman of W. and E. Yorkshire branch of the Institution). The discussion on "Compressed Air as Applied to the Building and Civil Engineering Industries" was led by Mr. W. T. Scopes (past-chairman, London branch) and that on "Plant Layout and Equipment" by Mr. A. J. MacIntyre (past-chairman, Glasgow branch).

The paper which gained the Silver Medal of the Alexander Duckham Memorial Awards, 1952, was that on "The Automatic Machine in Industry" by Mr. B. Green, A.M.I.Plant E., of the E. Lancashire branch, in which he suggested a new approach to the automatic machine and provided a pointer to the problems which needed to be tackled and the means of dealing with them. The Bronze Medal went to Mr. E. Bradley of the W. and E. Yorkshire branch for his paper on "Industrial Exhaust Systems."

At the discussion on Institution affairs, Mr. L. G. Northcroft, O.B.E., chairman of the Education Committee, proposed that the Institution should set up its own national fuel policy committee and this was carried. Mr. Northcroft said that in the matter of fuel policy there was a point where operational efficiency came to a dead end, owing to some outside influence. Outside the efforts of the individual fuel user to establish a higher all-round standard of industrial fuel efficiency, there had seemed to be "a mass of passive obstruction" in the way of a properly co-ordinated policy for fuel utilisation.

He stated that the views of the users of fuel and power were heard far less than the views of the suppliers of fuel and power. The Institution of Incorporated Plant Engineers, representing the technical users of fuel and power in industrial production and services, had the competence to offer views and recommendations on fuel policy to the Government and to any advisory bodies set up by the Government.

### FUTURE ARTICLES

ARTICLES to be published in forthcoming issues of FOOD MANUFACTURE will include the fourth part of "The Chemistry and Physics of Macaroni Products," by J. A. Radley, M.Sc., F.R.I.C.; "The Principles of Freeze-Drying," by Melvin Nord; and "Australia Modernises her Vegetable Supplies."

# Soya—Staple or Substitute?

E. M. Learmonth, M.Sc.(Lond.), F.R.I.C.

**Consideration of the development of the soya industry in Great Britain cannot but lead to adverse comparisons with the progress made by the United States in this field. The reasons for the difference are not confined to the well-known American ability to put scientific discoveries to practical use much faster than anybody else in the world. They rest also on the very different economic positions of the United States and the British Commonwealth in terms of their command of supplies of drying oils.**

THE United Kingdom, until the outbreak of the second world war, had relatively little cause for anxiety about supplies of linseed oil owing principally to the favourable attitude of Argentina. The United States were not happy to be dependent on imported supplies and turned their attention to the soya bean, which, although it provided only a semi-drying oil, could theoretically be grown in their own country. The success with which they converted theory into practice may be measured by the rise in soybean production in the United States from 4·9 to 223 million bushels between 1924 and 1948. Subsequently it has been found possible by suitable treatment to make the semi-drying soya oil serve the needs of the paint and linoleum industries on a very large scale.

### Edible Fats and Oils

Similar reasoning held for the edible oil supplies of the two countries. The rich tropical sources of the Commonwealth contrasted strongly with the lack of tropical territory in the United States, for the tropical climate is the climate *par excellence* for the production of vegetable fats. That the soya bean might provide an answer to the American problem was suggested by the facts that it does not require a tropical climate and that its oil, being a semi-drying oil, could be suitably treated as an edible fat. In short, the Americans exercised a typically English spirit of compromise to make an Oriental plant serve the needs of an occidental nation in both edible fat and drying oil industries.

The emphasis in the foregoing remarks is all on oil and fat. Although the value of the protein residue of oil extraction processes was quite generally realised, at least in the value of animal feeding, the soya bean was still regarded as an oil seed.

It is remarkable that a seed containing at the most 22 per cent. of oil should have been regarded primarily as a source of oil. The fact that 35 to 45 per cent. of the seed was protein seems almost to have been overlooked.

At that time the question of supplies of protein food was not a matter of concern in the western hemisphere. The fact that soya had been a staple source of protein in Oriental diet for generations was no more than curious. The western nations were meat eaters, and vegetable proteins, if they were thought of at all, were generally thought of as the proper food for vegetarians, who were a bit cranky anyway.

Towards the end of the thirties the emphasis began to change. The ample supplies of meat to which we in the United Kingdom had been accustomed were dependent on exports from the southern hemisphere, chiefly from Argentina, a country outside the Commonwealth. The possibility of war raised doubts about the adequacy of the protein supplies of the nation. This is not the place to go into all the arguments for and against home-grown cereal crops *versus* home-killed meat, imported coarse grains, calories, minimal diets, and so on. It is enough to say that the need was realised of supplementing the conventional proteins of the British diet with some protein source having good keeping properties and as high a nutritional value as possible.

### Nutritive Value of Soya

In the meantime American soybean production had increased twentyfold, chiefly as a source of oil. The large proportion of residue was perhaps becoming embarrassing. Whereas in 1930 the

**Soya bean plots at Woburn, with Swedish varieties in background and Manitoba Brown in front.**

U.S.A. had imported 36,000 metric tons of soybean cake and meal, in 1939 she *exported* nearly the same amount as well as over ten million bushels of beans themselves. Research, stimulated by the annual production of some 100,000 tons of a relatively little known protein, disclosed several important facts.

The nutritive values of vegetable proteins were universally known to be much lower than those of animal proteins. The values for raw legumes—peas, beans, and lentils, including soya beans—were entirely in line with this widely accepted generalisation. Indeed, in 1941 it was shown that raw soya protein had a nutritive value even lower than that of the protein of white flour. But even as early as 1917 Osborne and Mendel had commented on the improvement in palatability made by suitable heat treatment, and at that time palatability was widely thought to be a measure of nutritive value, although Osborne and Mendel were not convinced of the truth of this assumption.

Further investigation showed that heat treatment had an astonishing effect on the nutritive value of soya. From a level poorer, in the raw state, than some of the poorest vegetable proteins, appropriate treatment raised it nearly to the level of animal proteins, certainly far above that of the most highly valued cereal, wheat. For example, Mitchell in 1947 showed that the net utilisation of the protein of lean beef was 75 per cent. and of soya 72 per cent. White flour was much lower at 52 per cent.

Most of this information became known only during and after the last war, and it throws a new and interesting light on the present-day problem of feeding the ever-increasing population of the world.

#### Shortage of High Class Protein

The changes in food consumption which have occurred in recent years are quantitative and qualitative. A rising population is demanding ever-increasing quantities of food, and the influence of western habits on Oriental populations is changing traditional diets. Sir Frank Engledow in his recent address to the Food Manufacturing Industries Research Association stressed both these facts. He instanced the increasing demand for beef in East African communities until lately almost entirely vegetarian, and the demand for animal protein in West Africa so high that "even the hides of cattle are eaten."

These changes raise two problems. On the one hand, the provision of sufficient suitable land to grow the required amounts of food and, on the other, the selection for human diet of the most economic foods. To quote Sir Frank again: "Simple quantitative inadequacy of food may be hard to avert. With foods of specific nutritive importance matters are likely to be worse." In short, are we in Britain likely to see again the plentiful supply of animal proteins which we took for granted before 1939? Are we not likely to face in the not far distant future even graver difficulties? Should we not be wise to provide for the national diet a protein source which is nearly as nutritious as the animal proteins, is far cheaper to produce, and is much more amenable to storage, and use it to supplement such supplies of meat, milk, and eggs as may be available?

#### Co-operation or Legislation?

There can be only one answer to this last question. It is precisely the action that was taken when the crisis was upon us in 1940. At that time the problem was solved by Government regulation, and it was one of the misfortunes of war that the job was so mishandled that the name of soya grit still stinks in the nostrils of every sausage manufacturer in the country. That mistake need not be made again. Indeed, it may never be necessary to fall back on "paternalistic legislation" at all; none of us is much enamoured of the idea of a Ministerial sausage.

The alternative to such legislation is the voluntary acceptance of the principle of protein supplementation by food manufacturers as one manifestation of enlightened self-interest. So far a true appreciation of the nutritive value of soya is limited to a few. The majority are content to assess their products in terms of pure sales appeal based on the happy belief that the public cares nothing for nutrition. This is a belief that is rapidly losing what little foundation it ever had.

The nature, quantity, and quality of food have never occupied so much attention by ordinary men and women as they have done since the war. This preoccupation is unlikely to decrease. On the contrary the attention of the man in the street is likely to become stronger, more critical, and better informed.

#### Soya in Manufactured Foods

In the meantime what grounds exist for including soya as a basic ingredient in manufactured foods? To the manufacturers who put cost before nutritive value they can be found only in functional purposes by which their products can be given greater sales appeal. Such grounds are not lacking in a wide variety of manufactures provided the right type of soya is used for the purpose. Much has yet to be learned about the influence of variety of bean on the properties of the finished product. Little progress can be made in this field until soya growers have some incentive, and much practical research has yet to be done. But in the wider sphere prejudice and ignorance still cast their shadows over the minds of many potential users.

It is astonishing to learn that supposedly well-informed food manufacturers and technologists still think of soya as a single substance incapable of variation. Does a flour miller or a baker acknowledge no difference between Manitoba No. 1 and English or for that matter Manitoba No. 5 in wheat flours? Why then does a sausage manufacturer think soya can only be the grits he was compelled to use during the war? Why does the cakemaker think that soya must have a strong flavour of raw beans and go bad in a few weeks?

For over 25 years a variety of soya products has been used for the preparation of foodstuffs in

ever - increasing quantities in Britain. Is it not time that this sort of ignorance was shattered? Let us admit that in the early days of the industry products of poor quality were on the market. Is it not at least possible that some improvements have been made since then? The complacent comment is often heard: "I tried soya in 1932 and I've never touched it since." Such sententious stupidity is hard to credit. Is margarine still the tallowy grease it was in 1917?

Bearing in mind that our real purpose is to improve the nutritive value of important foods as a contribution to the nation's well-being, let us consider in what ways this can be done without loss of the sales appeal which is the touchstone of success to most manufacturers. Without loss? Experience shows that consumer preference is enhanced by suitable choice of the type of soya and the quantity and manner of its introduction.

**Sausages**

Let us deal first with sausages, the food best suited to carry nutritive value to a wide range of the population, perhaps the one most in need of improvement and certainly the one in which the value of soya is least well appreciated. For this product the soya should be free from husk. It may be a fine flour, a relatively coarse meal, or a mixture according to the eating qualities desired in the finished product. In either case the soya should be a full fat product. It must be quite free from the leguminous flavour of the raw bean and from bitterness—an aftertaste characteristic of poor quality and quite different in character from the raw bean flavour. Enzymes—peroxidase, lipoxidase, and lipase—must be completely and finally inactivated.

The addition of 5 to 15 per cent. of such a soya to a 50 per cent. meat sausage has been shown by consumer tests to be preferred to the standard sausage. The protein content is raised by 20 to 60 per cent. with a protein of nearly the same nutritive value as lean beef, the eating qualities are much improved, and the sausages do not burst and split during cooking. The antioxidant effect of soya hinders the development of oxidative rancidity in the fat of the sausage and so improves its keeping qualities. These results are markedly at variance with the experience of most sausage manufacturers when soya grits were used. This is not surprising since the soya grits complied with scarcely any of the requirements of the above specification.

**Bread**

With bread there are two aspects to be considered, only one of which is related to the enhancement of nutritive value. The addition of 10 to 20 per cent. of a good full fat debittered soya to the wheat flour, together with additional water, produces a loaf of excellent eating qualities and enhanced nutritive value attributable not only to the additional protein content but also to the well-known supplementary effect which soya exhibits when used in conjunction with cereal proteins.

**A soya bean plant, showing the ripening pods.**

*Photos Dr. H. H. Mann, Woburn Experimental Station.*

The loaf is readily made by a "No Time Dough" process. It has a smaller volume than a normal fully fermented dough, a golden coloured crumb, and a most attractive nutty flavour. It is excellent also as toast, having a crisp short bite and a richer flavour than ordinary toast.

In view of the present trend of opinion away from chemically bleached flours, bread of this type might easily achieve even higher popularity than it did before the war, when a steadily increasing demand was encountered by one or two firms who made a speciality of it. Its widespread use would add substantially to the protein value of the average diet.

The use, already widespread, of an enzyme-active grade of soya in much smaller quantities is hardly relevant to the present subject. Here it is a question of a natural bread improver, that is, an adjunct free from the criticisms which may be levelled at artificial chemical substances, which improves the volume, crumb colour, texture, and keeping qualities without making a marked change in the general character of the loaf. Soya for this purpose should retain the full activity of the natural enzymes and enzyme inhibitors associated with the natural bleaching and dough stabilising properties required. The retention at the same time of the leguminous flavour is of small consequence since this is entirely removed during baking. The small proportion added (up to 2 per cent.) does not substantially raise the protein content of the loaf. It is rather the technical properties that are enhanced.

**Cakes and Biscuits**

By the use of soya flour a significant increase in protein content of cakes and biscuits and a valuable supplementing effect on their nutritive value can be achieved together with useful improvements in technical properties. Again a full fat debittered soya should be selected. It should be free from leguminous or bitter flavour, without enzyme activity, soft in texture, and pale in colour. The addition of soya at the rate of 10 per cent. of the wheat flour weight is generally recommended with some additional water ac-

cording to the nature of the product.

In cakes an improved bloom, finer and softer crumb, brighter colour, and resistance to staling may be looked for. Biscuits are protected against oxidative rancidity and hair cracks are eliminated. Breakage losses in packing and transit have been found to be reduced markedly and a crisper, shorter bite obtained. Bloom is also improved.

It is also possible, by the use of such soya, to make, with a recipe low in fat, goods of a quality comparing favourably with those of higher fat content. In general an "extension" of 25 to 33⅓ per cent. in fat supplies may be achieved in this way.

The success of such technical improvements in quality is the basis of much of the existing use of soya in the British food manufacturing industries. A plea might well be entered for extension of its use on this basis alone, but we are here concerned with nutritional value rather than sales appeal.

#### Protein is a Selling Plus

It is at least clear that significant improvements in the protein content, and the protein quality, of the national diet can be made without any loss of the factors which constitute sales value. In all the above items enhanced appearance, shelf life, flavour, and texture are accepted results which are widely realised. Lower manufacturing costs are frequently obtained as well. The improved nutritional value is the only "selling plus" that is overlooked.

In meat products the importance of higher protein values can hardly be overstressed. Sausages in particular are regarded with deepening suspicion as the years go by because of the excessive proportions of starchy fillers and the low content of high class protein. The addition of soya containing 60 per cent. of protein and fat can hardly lead to criticism of the breadcrumbs and cream bun variety.

Dr. Norman Wright has called attention to the large proportion of the nation's energy provided by the bakery trade. Addressing the Annual Meeting of the British Baking Industries Research Association, he said that bakery products provide between one-third and one-half of the total calories of the average diet—more than three times as many as any other class of product. This is a responsibility which reputable manufacturers will be glad to carry.

The growing sense of social responsibility shown by large traders in all spheres is only one reason why they will seek to improve the overall nutritive value of their products. Calories can be cheaply and easily provided from starch, but the public are growing increasingly tired of starchy foods. Most people agree that as a nation we lack, since the war, the drive and determination associated with a high protein diet. As a source of protein, soya has already been shown to be eminently suitable for enriching bakery goods in general. The improved sales value of the goods so enriched is an additional reason for adopting this method of guarding the protein content of the diet.

It is in all respects better that any steps necessary for ensuring adequate proportions of protein in the diet should be taken by co-operation of the trades concerned. The alternative is legal enforcement of certain standards with all the objections that such methods carry with them. The prospects of protein supplies held out by those who have studied the global position give good reason for thinking that soya will continue to increase in importance as a staple source of protein in the British diet. We should be wise to prepare in good time.

## Food Hygiene

In the foreword of their book,* Dr. Harvey and Mr. Hill state that the reader "may perhaps wonder why a volume on food hygiene should deal in some detail with the manufacturing aspects of food production, and even with such subjects as food values and nutrition." They consider that "a knowledge of manufacturing methods, and of the constituents of various types of food consumed in homes, cafés, canteens, restaurants, and the like throughout the country, is necessary to a proper understanding of the many hazards which may arise and that information of this character should be included, for reference and practical purposes." The wonder referred to is not dispelled by a perusal of the book, which appears to be primarily a compendium of food manufacture, with hygiene more of a subsidiary subject.

For instance, considerable space is devoted to detailed information on the production and refining of salt and a very crowded paragraph on pickles is found among condiments and spices.

There are thirty chapters covering all kinds of foods and their preparation, in which the treatment of the subjects is general. Some inaccuracies have crept in. For instance, on page 76 it is stated that "meat extracts are generally prepared from lean meat and this is extracted by means of boiling water under high pressure. The resultant liquid is evaporated under vacuum." Immediately after this it is stated that "these extracts in themselves are usually by-products of the preparation of preserved meats." It is difficult to see how meat extracts could be *generally* prepared by the process named while also being *usually* by-products. In any case meat extracts were originally prepared by the leaching of lean meat but certainly not by boiling water under high pressure.

The chapter on canning is of a general nature and, although the information given is on the whole accurate, practical details are lacking.

The book is well produced and, as has been suggested, gives a general picture of food manufacturing, from which the reader will deduce the necessity for hygiene, and its perusal may induce the extra diligent enquirer to consult the literature for further information. But by reason of the ab-

* *Food Hygiene.* By Wm. Clunie Harvey, M.D., D.P.H., F.R.San.I., and Harry Hill, F.R.San.I., A.M.I.S.E., F.S.I.A. Pp. 511 + viii. H. K. Lewis. Price 35s.

sence of a bibliography he will be obliged to make a search on his own account.

Another book* for students of public health, agriculture, and meat technology has dealt with the subject of the inspection of food (as the author says) in a simple and not too highly scientific manner. It is purely an educational book, one of its features being an appendix containing questions set at previous examinations, these questions being linked up with the subjects treated in the different chapters.

To take an example of the treatment, chapter 7 deals with the preservation of foods and devotes a little over two pages to the whole subject of canning. Under processing of corned beef or mutton, to which one page is devoted, the method is described as "heat treatment under pressure in retorts, the time depending on the size of the cans. The period varies between one and six hours at a temperature of about 220°F." Obviously this information is not intended for would-be canners, but to give a notion of what happens. Even so, these products are usually sterilised at 240°F. and not 220°F.

One of the questions at the end of the book is: "Describe the process of canning, indicating the essential objects of each stage in the process." It is questionable whether the examinee would be in a position satisfactorily to answer this question with the information given and, unfortunately, his task would be more difficult because of the omission of a bibliography.

However, the book contains a great deal of technological information which, if absorbed by the student, would give him a good general notion of his subject.

* *The Inspection of Food.* By H. Thornton, B.V.Sc., M.R.C.V.S., D.V.H., F.R.S.I. Pp. 223+viii. Baillière, Tindall and Cox. Price 12s. 6d.

**TO AUTHORS**

**FOOD MANUFACTURE is prepared to consider the publication of articles on the subjects covered. Books on food would also be considered.**

# The Modern Farm Dairy

THE design and equipment of the modern farm dairy is a matter which should receive considerable forethought and careful planning. New and more up-to-date equipment may be installed from time to time without a great deal of trouble and reorganisation, but the premises, once erected, must usually remain basically unaltered for a number of years.

The aim of the author of a recently published book* has been to assist prospective buyers in the selection of dairy equipment most suitable for their particular requirements, especially as regards the size or capacity of the plant based on the daily milk production.

Into the six chapters of the book, the author has crammed a wealth of information. Beginning with the dairy buildings, the essential requirements which demand prior consideration when planning the farm dairy are described. Suggestions are given as to the most suitable dimensions and for the actual construction of the dairy, *e.g.* the materials best suited to exterior and partition walls, and lighting arrangements.

The second chapter deals with the types and sizes of milk cooling equipment and the advantages and disadvantages of such methods as brine cooling, direct expansion cooling, churn immersion cooling, and chilled water cooling. In this chapter the author also discusses the sectional cold room and the built-in cold room for the storage of milk.

The importance of sterilising and the correct routines to be followed in the cleansing of utensils and equipment are described in the third chapter, in which the author also incorporates descriptions of the different types of bottle washer and of steam raising methods. Regular cleaning and de-scaling no longer present any serious inconvenience or difficulty. Special solutions are available, the use of which enables a boiler to be de-scaled, without dismantling, in less than two hours. Such cleansing operations are fully described in this chapter, together with an outline of the numerous types of sterilising chest.

Heat treatment and bottle filling equipment is the subject of the fourth chapter and finally, the author gives a useful selection of dairy layout plans for producer wholesalers and retailers with herds ranging from 20 cows and under to herds of 100 cows. For each size of herd, the author lists the requisite equipment and appropriate capacities of that equipment.

The final chapter, comprising data and tables, rounds off a book which will be of the greatest assistance to all dairymen and which will enable those about to plan their dairy to avoid the common mistake of underestimating the amount of space necessary in the milk cooling and washing and sterilising rooms to allow efficient and economical operation.—J. R.

* *Modern Farm Dairy Equipment.* By Ronald T. Needham, A.Inst.R. Pp. 91+xi. Illustrated. Leonard Hill Ltd. Price 15s.

# Typefaces

THE importance to this country of export printing cannot be overstressed. Print in the form of books is an exportable commodity and, in the form of advertising and sales literature, is an export service.

All those interested in fine bookwork and in the graphic arts will therefore welcome a recently published book* which shows at a glance the uses and character of typefaces.

Although it is limited to those carried by the publishers of the book, the display range is wide and includes typefaces as different as Albertus and Union Pearl or Chisel and Thorowgood's Fat Face Ital., and the illustrations help to illuminate both the character and the period of origin of many of these typefaces. The publishers are to be complimented on the attractiveness of the spiral binding and the presentation as a whole.

* *A Book of Typefaces.* Pp. 74+v. W. S. Cowell. Price 25s.

# The Chemistry and Physics of Macaroni Products

**Part III**

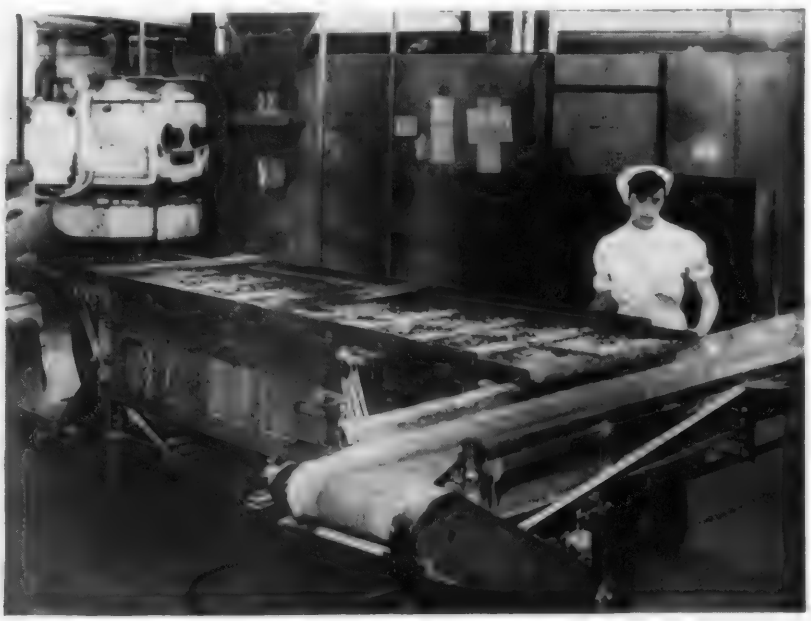
**J. A. Radley, M.Sc., F.R.I.C.**

**In this instalment the author, continuing the discussion of the appearance and colour of macaroni, enlarges upon the extrusion process and on the effect of the different pressures on the characteristics of the product. The methods that can be adopted for testing degrees of opacity are also discussed.**

TRANSLUCENCY is very desirable in macaroni products, and in the durum wheat kernel both the endosperm and each individual starch granule are translucent. During the macaroni making process the translucency of the product is lost until the extrusion stage when it is partially or completely restored. Adding moisture to the wheat during tempering dulls its translucency. The milled semolina has a whitish yellow colour which is dry looking, and after being freshly wet in the mixer it is granular until smoothed to a putty colour when put in the kneader. After kneading the dough is more rubbery and plastic but still opaque, and during the "rest" period at 100°F., or higher, it softens and the colour brightens somewhat, but the clear translucent yellow colour does not return until pressed. Several workers[26, 32] have elaborated small scale plant for the evaluation of experimental breeding samples of durum wheats, and their observations on the extrusion process are of interest.

### Omission of Resting Period

Several of them omit the resting period after making the dough when operating on an experimental scale, since they found that increasing the extruding pressure eliminated any variations in the product introduced by having a resting period, or variations due to the length of this period, while little or no rest period occurs in several large scale continuous processes used in production. This point may be of interest to manufacturers who use presses working at comparatively low pressures or may be of possible importance when a batch appears too slack or wet when it would extrude too quickly for the desirable pressure to be applied for a sufficient length of time. Although Fifield *et al.* pressed their experimental samples in the form of discs and did not extrude the paste, their observations are significant and can be applied to the extrusion technique. In commercial practice[25] pressures range from 2,500 to 5,000 pounds per square inch. Macaroni made at these pressures were less translucent than disc samples prepared by Fifield *et al.* from the same wheats at pressures of 8,000 pounds per square inch. This suggests that commercial macaroni may be made more attractive by subjecting it to higher pressures before pressing through the dies. If this increase of pressure was brought about by altering the semolina/water ratio so as to increase the yield point of the plastic mass less water would have to be removed in the drying process. In practice also it is found that, within certain limits, increasing the water in the mix improves the colour so that the two factors appear to affect each other (see also below). Certainly further work on this point would be justified.



**The press head is shown on the extreme left of the extruder and pre-drier.**
*Leonard Hill photo.*

### Rupturing of Starch Granules

The above workers found that, after drying under similar conditions, the moisture content of the unpressed discs was 1 per cent. higher than that of the pressed discs. During the moisture estimation (by oven drying at 130°C. for one hour) the pressed discs went golden brown but unpressed discs remained white. These facts might suggest that starch granules are ruptured during the extrusion process and possibly partially hydrolysed to dextrins. The possibility of hydrolysis of ruptured starch granules during the drying

process has already been mentioned. The author has not, however, been able to confirm that further starch granules are ruptured during extrusion over those already present in semolina due to the milling processes. In one experiment carried out in the author's laboratory, a mix was severely ground in an extruder for some time, allowing the heat of friction to raise the temperature appreciably, but the number of damaged starch granules was not significantly greater in the product than in the starting material. The effect on the gluten, however, was far reaching and will be discussed later. The water distribution is probably more uniform at the higher pressures.

**The macaroni leaves the conveyor and spreader and is placed on racks prior to entering the processing chamber.** *Leonard Hill photo.*

#### Modifications of Disc Testing

The disc method of testing was modified in certain ways in 1943 by Cunningham and Anderson,[32] the chief modifications being the use of (1) a thermostatically controlled motor driven mixer, (2) motor driven sheeting rolls, and (3) wax-coated celluloid instead of Cellophane to cover the discs during pressing. They describe a photometer for measuring opacity of the discs in detail and also the derivation of the required formula for calculating the coefficient of optical absorption. Again the emphasis in their paper is on colour of macaroni, but they also note that longer mixing times increased the opacity by increasing the number of air bubbles present.

They also noted that, with two discs made from the same semolina, increased pressure gave increased translucency and the more translucent disc appeared more yellow. The reason for this would appear to be partly due to the increased penetration of light in a more translucent product so that more pigment is traversed and the selective absorption of light is increased. They used the measurement of the opacity of discs as a supplementary method to the more commonly used measurement of disc colour by matching against Wallace and Tiernan discs. The latter process is tedious, subjective, lacking in precision, and subject to appreciable personal error. The measurement of the absorption coefficient on the other hand is claimed by the above workers to be objective, precise, and reproducible.

#### Measurement of Opacity

Using the measurement of opacity technique they found that doubling the pressure reduced the absorption coefficient by almost 50 per cent., and concluded that pressure of extrusion is by far the most important of the processing factors up to this point. They found that additional time in the press had the same effect on opacity or translucency as increasing the pressure. After passing the plastic threshold the rate of flow of the paste increases with increasing pressure so that a low pressure for a longer time will allow a similar amount of internal flow and adjustment to that obtained with a higher pressure for a shorter time. The effect of a given change in one factor is not constant but depends upon the level of some other factor or factors. Since pressure has the largest effect on paste properties it is not surprising that it is also involved in other major interactions. With increased mixing time the discs become more opaque, and this effect becomes very large when the discs are subsequently pressed at 800 pounds per square inch, but it is very small at a pressure of 1,600 pounds per square inch. Alternatively, the effect of doubling the pressure is far smaller when the dough is mixed for 40 seconds than when it is mixed for 100. This effect is due to the incorporation of many minute bubbles of air in the dough. With low mixing times the bubbles are fewer and larger. The subsequent application of pressure tends to decrease the number of bubbles and increase their size.

At high pressure the length of pressing time has but comparatively small effect on quality, but at low pressures an appreciable change of quality is obtained by increasing the time of pressing.

#### Microscopic Examination

Smith, Harris, Jesperson, and Sibbett[34] have followed up the work of Cunningham and Anderson and examined macaroni discs made at different pressures, microscopically. They confirmed that pressure increases translucency by coalescing the minute bubbles present into larger ones. They found that macaroni discs which had received no pressure con-

**The racks of macaroni are placed in the processing chamber.**
*Leonard Hill photo.*

tained great numbers of air bubbles less than 20 mμ in diameter, and were very opaque owing to light scattering. Application of 3,000 pounds pressure per square inch for four minutes coalesced these bubbles, giving translucent discs with bubbles 40 times as large in diameter, and reducing the number nearly 40,000 times, while light transmission increased six-fold. Intermediate treatments gave intermediate effects, but all results showed curvilinear relations. They found that a fractured surface shows many bubbles 200-400 mμ in diameter, introduced when forming the dough.

Following application of pressure, there was a lag period before significant changes in bubble size or number were evident. This was interpreted as the "yield value" characteristic of plastic systems. At lower pressures the time factor was a very important influence. The first strands of macaroni pressed from a batch of dough are opaque because the pressure has not been operating for sufficient time. Laboratory "slab tests" which omit pressure will not give a translucent product.

Varietal differences in light transmission of six widely different varieties were not striking and could not be related to differences in yellow pigment, nor to undesirable red or grey colours. Two thousand p.s.i. for 60 seconds gave macaroni of satisfactory colour and translucency, and there was no differentiation between varieties. They also found that the colour of tube macaroni could be estimated from that of micro-discs, processed from the same material.

### Translucency and Bubble Numbers

Light transmission, a measure of translucency, is the resultant of two opposing and interdependent forces—decreasing bubble numbers and increasing bubble size. Because of its mathematical relation to size, bubble number changes faster than size; and, therefore, translucency increases as bubble number decreases, despite simultaneous increases in bubble size. Pressure, by causing the bubbles to coalesce, increases the translucency.

Martin *et al.*[42] rested the dough under pressure in their small-scale experimental plant, as is often done in some commercial processes, since this stage is claimed to lead to maximum efficiency during the extrusion process. They considered that to obtain the best surface on the macaroni, the extrusion pressure should be fairly low, but to obtain a dough that requires comparatively little pressure for extrusion requires either an excessively long rest period or a shorter rest period during which pressure is applied to the dough. Thus with any extruded a rest period can be adjusted first for convenience, and the optimum pressure for this time may then be adjusted with due regard to the limitations of the extruding plant.

### Pressure during Resting Period

These workers applied pressure during the resting period and found it had a two-fold effect, *viz.* it appears to make the dough more translucent, and decreases its viscosity. The pressure required to extrude the macaroni at a constant rate is a direct function of the viscosity of the dough, and assuming that the die itself is in good condition, the surface of the macaroni depends on the extrusion pressure; the lower the extrusion pressure the better the surface of the macaroni. Three factors are inversely related to the extrusion pressure—absorption, rest pressure, and die temperature. The values of these factors were all fairly high in the method chosen by the above workers, and all contributed to a low extrusion pressure, and thus improved the surface of the macaroni. The lower limit of extrusion pressure is that at which the dough ceases to weld properly after being forced through the three sections of the die.

As discussed above, pressure during resting probably makes the dough more translucent by its action on the bubbles present, and it is highly probable that the decrease in the number of the bubbles leads to a decrease in the viscosity, since the presence of numerous bubbles tends to increase the viscosity in a similar manner to the increase in viscosity of a shaving lather over ordinary appreciable-sized soap bubble foam.

### Extruding Machinery

Most of these fundamental requirements are satisfied by the

Buhler extruder. The capacity of the machine is large enough to allow adequate mixing and retention time to get a homogeneous mix of equable temperature throughout. In the first part of the extruding mechanism the material is forced through minute holes in a series of "baffle-plates" before reaching the extruding die proper. The pressure built up on the "feed-in" side of these plates must be very great, and it will not only assist the moisture to equalise throughout the dough but will cause minute bubbles to coalesce and thus increase the translucency as has been discussed, and a lowering in viscosity is probably achieved. After passing through the baffle-plate the pressure on the extruding mass drops and therefore conditions are advantageous for obtaining a good surface on the extruded material.

The length of the extruder barrel, the shape of the worm, and the shape of the back of the die are probably of considerable importance, since they would largely determine the pressure built up and the length of time it was acting on the charge.

Another machine which attempts to give proper weight to fundamental requirements is the fully automatic continuous "Artos" vacuum extruder. It is fed automatically with semolina in a fine film and with water, the temperature of which is controlled thermostatically. Arrangements are made for mixing and kneading, and when it passes to the extruder section it is under vacuum. The effect of this is to remove air bubbles and some moisture so that the extruded goods have a good translucency, better colour, smooth surface, and, it is claimed, that the product does not discolour on storage owing to absence of oxygen in the body of the material.

#### Advantages of Pressed Products

The above suggests a number of interesting fields for study. The smooth, translucent surface of the macaroni discs obtained by the above workers suggests that macaroni *presses*, if efficiently designed and operated at high pressures to stamp out the shapes (rather than extrude them through a die), might give a more attractive product, especially for short goods. Since the higher pressed products appear to be less sensitive to drying conditions, this further advantage might be gained by this method.

#### Sensitivity to Changes

Some workers consider products made at high pressure to be less sensitive to changes during drying, while others, Binnington, Johannson, and Geddes,[41] consider pressure to be an important factor on the ultimate strength of the product. The author can support these findings and considers that, again, the effects can be traced back to the influence of pressure on bubbles. In the drying process any fissure, crack, or bubble in the body of the material can be the focal point of internal strains or provide a path for a rupture in the material started nearby. The fewer the bubbles the less the number of centres of internal stress. Work in the writer's laboratory indicates that, contrary to the firmly held belief of a number of macaroni manufacturers that fractures in macaroni under stress occur chiefly where there is a bran particle, most breaks occur at the site of a bubble, and only a few occur where there is a bran speck.

*(To be continued)*

*The photographs used in this article were taken in the factory of Green's Beatall Food Products.*

## Agricultural Science

A SURVEY of the work of the Rothamsted Experimental Station at Harpenden is given in Sir William G. Ogg's introduction to the 1951 report.

Experimental work on fertiliser placement has been continued and extended by the Chemistry Department. The advantage in the case of peas and beans of placing the fertiliser beside the seed has been shown over four seasons, and where special placement drills are not available, farmers are advised to incorporate the fertiliser for these crops in the soil by ploughing or cultivation. Preliminary results on potatoes planted by machine show that fertiliser placed in contact with the seed, or in bands beside it, gave higher yields than fertiliser broadcast on the flat or placed in front of the seed-shoe of the planting machine.

In the Plant Pathology Department much of the work has been devoted to virus diseases. The effects of ultra violet radiation on viruses and on plants were studied. This treatment reduces the infective power of viruses, and in some cases the infectivity is less when the inoculated leaves are kept in darkness. The damaging effects of ultra violet rays on the leaves themselves are counteracted by keeping them in daylight after irradiation.

Further work has been carried out by the Nematology Department in the potato root eelworm. The search for substances to control this pest has been continued and several show a certain amount of promise.

The effectiveness of an insecticide varies with the species of insect on which it is applied, and the reasons for this variation are being investigated by the Insecticides Department as part of their research programme. Field experiments on the control of wireworms have shown that Aldrin and Chlordane give promising results, and experiments on the control of black aphis on field beans have indicated that effective control of the aphis and a greatly increased crop yield can be obtained by a single application to the beans at a very early stage of infestation of any one of several different insecticides.

In addition to full-scale surveys on the work of these and other Departments of the Station, the report contains a soil survey of England and Wales and three special reviews entitled "Beet Yellows Virus and other Yellowing Virus Diseases of Sugar Beet," "A Review of Work on Manganese Oxidation in Higher Plants," and "How Far do Insects Travel?"

# The Packaging of Potato Crisps

**In the past few years, there has been a considerable increase in the popularity of the potato crisp. That the industry has taken on a new status is indicated by the recent formation of the Crisp Section of the Food Manufacturers' Federation to promote the best interests of all crisp manufacturer members and equitably to regulate and distribute the raw materials, especially frying oil, still in short supply.**

THE increase in the prices of frying oil used in the manufacture of potato crisps is out of all proportion to their present cost to the public which has been made possible to a large degree by the extensive application of improved manufacturing techniques in the industry. For example, major advances have been made in the field of automatic cooking, but it is probably in the packaging operation that British manufacturers have achieved the greatest increase in efficiency and cost reduction. By packaging is meant the whole process from the delivery of the crisps in bulk, from the cooking vats to the despatch of the tins of sealed packets.

One of the take-away conveyor belts at the filling section.

In the earlier days of the industry, the quantity of crisps per bag was determined by hand weighing and, in an endeavour to keep well within the requirements of the Weights and Measures laws, bags were almost invariably overweight, being somewhere in the neighbourhood of plus 20 per cent., with no guarantee of standard weight. Obviously, unless the packer had unlimited time to fill and adjust each package, there could be no absolute guarantee. It is against this background that the impact of mechanisation, in the form of automatic weighing and filling, has to be judged.

A general view of the first half of the packing room in a potato crisp factory showing the raised platform, three "shuffler" feeds, three pairs of Hy-Tra-Lec machines, and the beginning of the three sealing benches. In the immediate foreground a number of unsealed packets have been left deliberately in the top take-away conveyor to illustrate the function; in practice they would have been sealed and dropped through to the lower take-away earlier in the line.

*Photos Industrial Products (Speco) Ltd.*

In 1948, in view of the apparent need for automatic weighing and packaging machinery similar to that used in America, arrangements were made for equipment of this nature to be manufactured in Great Britain, a new company being formed to market and service the British machine.

A number of major modifications were necessary to adapt the machine to British conditions, especially in respect of temperature variations in factories, but it has now received general approbation and in the past three years over 140 of this particular type have been installed in the United Kingdom.

### Capacity of the Machine

This automatic weighing machine conforms to the regulations covering such equipment, is capable of governing its measuring operation so that it does not deliver any underweight, and controls overweight within 10 per cent. It can weigh and fill packets automatically at rates of up to 50 to 60 per minute, depending on

the feed arrangements, but normally an average speed of 30 to 40 can be maintained accurately for long periods by one operator.

The installation of this type of machinery enabled one company producing daily 3,000 tins, each containing 18 bags, by the old hand-weighing and filling methods, to increase its output, from the same quantities of raw materials, to 3,300 tins per day and at the same time reduce its labour force in the packaging section by 40 per cent. This represented an increase in sales revenue of nearly £50 per day, in addition to an appreciable reduction in the costs of production.

The packaging operations start with the crisps entering the line in mass in large bins. The feed to the machines is then made either by a horizontal conveyor with ploughs, each plough diverting part of the flow to a vibrator feed on the machine itself, or by one or a series of "shuffler" feeds leading to the vibrators. The shuffler is, in effect, a large triangular tray sloping down to a narrow discharge at the apex of the triangle, the whole tray being vibrated so as to spread the product out and produce an even discharge.

The crisps are then measured into 1 oz. weights, and delivered *via* discharge spouts to the packets or bags which are fed by hand. The filled bags are then placed on a further conveyor for insertion of the salt twists, and the bags are sealed, either by paste or heat sealing. A further conveyor delivers the sealed bags to the tin packing benches.

The basic unit of the machine is the weighing element which utilises the volumetric "positive displacement" principle, and which can be pre-set to weigh any specified measure in the range ½ oz. to 4 oz. It can also be used for packaging such products as biscuits, cheese straws, and confectionery.

## Pest Infestation

THE task of the pest infestation laboratory of the D.S.I.R. is to study the insects which cause the loss of and damage to stored foods and other products, such loss amounting to millions of pounds each year. The progress made last year is described in a report* just published.

The insect population left in warehouses after the stores have been taken out was one of the subjects of study. Some of the foodstuff is left in the cracks of the walls and floors where the insects can live and remain immune from the action of sprays and fumigants. When the warehouse is filled again, the insects emerge and invade the food. In one of the buildings, which had wooden cavity walls, over 7,000 of one of the main grain pests were found in one small area between the walls.

The object of another survey was to identify the mites attacking cheese and to ascertain what conditions favour them and what effect methods of storing and curing have on infestation. It was found that mould-ripened cheese, especially Stilton, were most likely to become infested as they were ripened for a long time in an environment which is perfect for mites. A series of cheese is being kept experimentally, all infested with mites at the same time. This investigation, which is being carried out in collaboration with Reading University, is hoped to provide valuable information about the rate of damage by mites.

The results of the investigations of insects and mites in disused birds' nests show that these are an important source of attack on nearby warehouses and dwelling houses. Over 25 species of insects have been found in the nests of sparrows, pigeons, swallows, and other birds. The kinds of insects found in such nests correspond almost exactly with those that are found in a neglected food warehouse.

Work on blowflies in slaughterhouses has been continued to ascertain the severity of the "blown" carcass problem, the species of fly causing the damage, and the most attractive kinds of meat. It has been found that bluebottles, although they are only five per cent. of the population, cause 90 per cent. of the damage.

A large multiple store collaborated in experiments on the over-wintering of flies. Seven premises were searched during the winter. Only in one store were a few flies found. It seems unlikely that they stay in the stores and reinfest them in the following spring. Thus the problem of how flies spend the winter still remains unsolved.

Methods of fumigation at reduced pressure have been tested. The fumigant used was methyl bromide. The idea is that at pressures lower than those of the atmosphere, penetration is deeper and more rapid. The tests showed that with granular products such as wheat or groundnuts there is no advantage over normal "atmospheric" fumigation. However, penetration into a box containing compressed dates, which is normally extremely slow, was greatly improved. Experiments are continuing to improve the efficiency of this promising method.

Other research described in the report includes work on taint in wheat flour produced by fumigation and the mechanism by which "DDT-resistant" houseflies break down the insecticide into a harmless substance.

* *Pest Infestation Research, 1951.* Pp. 36+iv. Published for the D.S.I.R. by H.M.S.O. Price 2s.

### Lecithin in Food Processing

(*Continued from page* 397)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# Productivity in Canning

**The visit to America of the Food Canning Productivity Team, representing a specialised section of the British food manufacturing industry, is the subject of a recently published report.* During their tour, which was made under the auspices of the Anglo-American Council on Productivity, the Team studied the food canning industries of the United States, with the exception of meat and milk.**

THE object of the visit was to assess productivity in the canned food industry, to compare it with that of the U.K., and to try to find the causes for any wide divergence.

Whereas the consumption of canned food per head of the population has nearly doubled in the last 25 years, both in the U.S. and in the U.K., the American consumer is using about twice as much every year as his British counterpart. This difference is a measure of the potentialities for the canning industry in the U.K., given the right opportunities.

The size of the population and the extent of its spending power provide an immense domestic market for canned goods, so that cannery operations are on a vast scale.

### Progress in Mechanisation

There follows as a natural corollary the utilisation of machines and mechanical aids to the greatest degree, and in this field the equipment of U.K. canneries bears little comparison with that of American canneries. Better machines and more of them, better and more mechanical devices, the use of water for fluming raw materials, greater speeds and greater outputs are all reported upon in detail in the relevant chapters of the report, and present a challenge to management in the U.K., where much of the equipment and methods could be improved.

There is in the United States a realistic attitude towards productivity which could with advantage be encouraged in the U.K. It is generally agreed that productivity itself is the goal and that, the more it is achieved, the greater the degree of "full employment" and "security" that will follow from it.

Workers do not normally work longer hours than their opposite numbers in the U.K., although willing to work long stretches of overtime on seasonal production; but they work with an alertness and a cheerfulness not generally regarded in Britain as the natural attitude towards employment.

In the comparatively free economy of America there is no single factor which has a more important bearing on productivity than competition, which is intense not only in industry but also in all walks of life. It is imperative to be in line or one step head. The dangers for the individual, and for industry, in such a society may be great, but so are the rewards. The average American citizen has a tremendous personal competitive sense, which manifests itself in everything "bigger and better" in the general pattern of "the American way of life."

There are no soft cushions of quotas or allocations of raw materials to lull managements into a false sense of security and to encourage them to indulge in a *laissez faire* attitude towards re-equipment and the development of their businesses.

Some relaxation of the consistent and apparently chronic shortages of equipment and raw materials available to British manufacturers must be striven for, so that greater competition can be introduced. American results indicate that such conditions are the mainspring of productivity.

### American Canneries

Most canneries seen were specifically constructed and equipped for the canning of seasonal fresh produce, and located "in the field" or close to the source of their raw materials. This applied particularly to the fruit, vegetable, and fish canneries, the last-named being built on the waterside.

Standard unit water-tube boilers are used. These are usually oil- or gas-fired and, being fairly clean installations, are sometimes sited in a corner of the packing department behind the retorts.

Practically no factory generation of electricity was noted despite the fact that water-tube boilers were in general use. It is felt that probably less attention is directed to overall fuel economy than in U.K. canneries, and this is to be expected since the conditions are so different in the two countries. The shortage of all kinds of fuel in Britain involves almost entire dependence on thermal stations for power generation, whereas in the U.S. there is considerable hydro-electric power generation. There are good supplies of natural gas and there is no shortage of oil fuel.

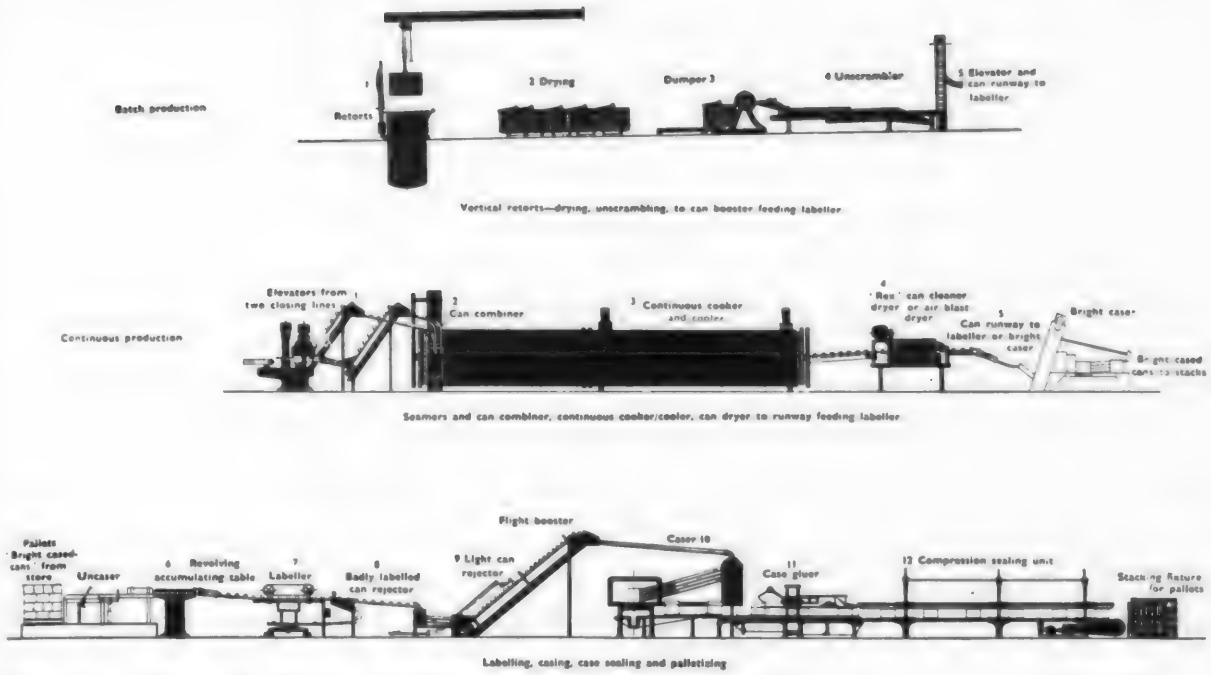
### Bulk Reservoirs

Among the methods and aids, which are used mainly after the filling stage, to assist continuous production are bulk reservoirs. Where processes do not permit a direct link-up of machines, as in pilchard canning, large bulk reservoirs for raw materials are employed, and wherever possible flumes are used for feeding the product into and out of the reservoirs as required. Bulk reservoirs are also used for sugar syrups, which are delivered by tank wagon.

### Canning Processes

The two large can-making companies—the American Can Company and the Continental Can Company—supply the bulk of the cans used in the American food industry, and also supply first-

* *Food Canning*. Pp. 86+xii. Anglo-American Council on Productivity. Price 7s. 6d.


Batch production
Retorts
2 Drying
Dumper 3
4 Unscrambler
5 Elevator and can runway to labeller
Vertical retorts—drying, unscrambling, to can booster feeding labeller
Continuous production
Elevators from two closing lines
2 Can combiner
3 Continuous cooker and cooler
4 'Rex' can cleaner dryer or air blast dryer
5 Can runway to labeller or bright caser
Bright caser
Seamers and can combiner, continuous cooker/cooler, can dryer to runway feeding labeller
Pallets
Bright cased cans from store
Uncaser
6 Revolving accumulating table
7 Labeller
8 Badly labelled can rejector
9 Light can rejector
Flight booster
Caser 10
11 Case gluer
12 Compression sealing unit
Stacking fixture for pallets
Labelling, casing, case sealing and palletizing

**Typical layout for continuous and batch production from sterilising to palletising.**
*Anglo-American Council on Productivity.*

class seaming equipment and other special machinery necessary for the satisfactory closing of their cans at high speed.

After seaming, the cans are elevated and fed to reliable continuous pressure cooker/coolers. These are fitted with a number of special features such as safety cut-outs, visible trouble-locators, and the newly developed micro-cooling transfer valve which enables atmospheric cooling to be used instead of pressure cooling.

After cooling, the cans are passed through an air-blast (or simple atmospheric) drier or a Rex cleaner-drier before passing to automatic labelling, casing, and carton-sealing equipment.

Rotating reservoirs or accumulating discs are installed between the cooler and the drier, and between the drier and labeller. These permit a continuous production flow even though the labelling machine may be temporarily stopped for cleaning or for refilling the label magazine. The accumulating discs are fitted with deflectors, and these, in the event of a hold-up on the drier, enable the cans to be discharged temporarily into crates.

The labelling machines are equipped with continuous label feed magazines, and in the run-off conveyor from the labeller an electric can rejector is fitted to detect unlabelled and loosely labelled cans and automatically to discharge them into a separate runway. The average speed of the labelling machines is about 400 cans per minute. After leaving the labelling machine the cans are elevated to discharge into the automatic caser or carton-filling machine. An alternative discharge is provided from the labelling machine to by-pass the caser and so permit hand carton-filling if necessary.

Attached to the elevator feeding the caser is a permanent magnet empty-can or partially-filled-can detector which discharges such cans into a separate runway.

### Storage of Cans

After casing, the filled cartons pass through the usual carton-sealing and compression unit, and the sealed cartons are stacked on pallets ready for removal by the fork-lift truck.

Where it is necessary to stack or store unlabelled cans, bright can casing and bright can palletising are employed. The unlabelled cans are fed directly to a "caser" or carton-filling machine and the filled unsealed cartons are then palletised for removal by the fork-lift truck.

Where continuous pressure cooker/coolers cannot be used, efforts are made to reduce handling to a minimum by using mechanical aids for filling and unloading retort baskets. Several systems are described in the report.

### Fruit and Vegetables

Some idea of the size of the fruit and vegetable canning industry can be obtained from the 1950 production statistics, *viz.* 80 million basic cases of fruits, 60 million cases of fruit juices, and 175 million cases of vegetables. The system of agricultural contracting ensures a high quality of raw materials. Grading for size improves quality and also helps the performance of preparation and processing.

### Improved Production Methods

The replacement of exhausting plant by vacuum syrupers and/or steam flow devices on closing machines enables fillers and steamers to be operated as combined units, with resultant economy in labour and floor space. Further economies are obtained

from the use of rotary cooker coolers, and from high-speed labelling and packing machines. Fruit cans are supplied with air-drying stripe lacquer applied to the side seams internally.

**Strained Foods**

The amazing demand for strained foods in America is an outstanding example of the foresight of an industry in anticipating and meeting a modern popular need. Comparatively unknown prior to 1930, they are now an accepted part of the diet of children, infants, and invalids, being consumed at the rate of 1,500 million packages per annum.

The inception and development of the industry in the last few years have allowed it to take full advantage of the high speeds of modern mechanisation. As a result, productivity is extremely high in this branch of food canning.

**Fish Canning**

The annual output of the U.S. fish canning industry is 1,000 million cans. The Team made a particular study of Californian sardines, which are comparable to the herring and pilchard of Britain.

A number of the methods employed by American fish canners could, the Team feels, be adopted by their British counterparts. These include the fluming of fish with chlorinated sea-water; the use of high-speed combined filling and seaming units; the establishment of oil reduction plants at the principal landing ports; the automatic packing of pilchards and herrings in round cans; and the installation of equipment which would permit oval cans to be band-labelled at 150 cans per minute.

**Cost Control**

The majority of smaller companies on the West Coast use a uniform system of accounting. Individual canners can therefore at regular intervals compare their own costs with the summarised average costs for the industry. Material usage and labour utilisation are controlled by the use of daily reports which are discussed and used at all levels by management and supervision. No effort is spared to maintain a high standard of efficiency although elaborate systems of overhead expense control are not often employed.

**Research Programmes**

Five principal groups of organisations undertake research on behalf of the industry. The National Canners' Association carries out a programme of research, its activities being of international repute. The report indicates several specific problems of research which have been tackled.

*Sterilisation Times and Temperatures.*—It is well known that the higher the temperature used for sterilisation, the better will be the quality of the finished product, provided the food is processed only for the necessary minimum sterilising time. This is based on the fact that the temperature co-efficient of the rate of destruction of micro-organisms under moist heat is considerably greater than that of the chemical changes in colour, flavour, texture, and vitamin content.

For processing conduction packs in stationary retorts the limiting temperature is about 250°F. owing to slow heat penetration and consequent over-processing of outer layers of the food. For convection packs in stationary retorts little is gained in time or quality by exceeding 255° to 260°F. owing to the "coming-up" time of the retort. In the case of agitating pressure cookers without pre-heating units, the upper limit of processing temperature is about 270°F. because of the initial pressure shock on the can. With pre-heating units, the maximum temperature is rather higher but is limited by strain pressures developed in the cans and by difficulties in cooling. In practice, in conventional canning, little is gained by exceeding 270°F.

The general tendency in progressive canneries is to increase the temperature of processing for many kinds of vegetables. Given well-designed cookers, easily maintained, liable to few stoppages, and fitted with automatic devices to minimise their effects, the advantages of "high-short" processing of many vegetable products, in improved quality and productivity, may well outweigh the higher initial cost of the equipment.

The principle of end-over-end agitation of cans is under investigation by the Continental Can Company. It has been shown that with gentle but efficient agitation an increase in the rate of heat penetration is obtained by causing the head-space gases to move through the contents of the can. There appear to be engineering difficulties in using this system in pressure cookers, but if and when they are overcome equipment will be available for producing products of high quality.

Although temperatures in the region of 270°F. are the limit for processing cans in agitating pressure cookers, it is well known that homogeneous fluid foods may be sterilised at much higher temperatures by pumping through heat exchangers. The food passes successively through heating, holding and cooling systems, the sterilising temperature being 300°F., or even higher, and the total heating and holding time five to 30 seconds according to the temperature and the nature of the product. It is in such systems that the maximum advantage is taken of the "high-short" process.

*Aseptic Canning.*—Research on aseptic canning has for its object the elimination of the conventional sterilisation of the filled and seamed can. In this process the use of heat exchangers operating at temperatures in the neighbourhood of 300°F. for very short periods of time gives a sterile product with less deterioration of flavour than is obtained by the usual processing methods.

*Irradiation.*—The Team's enquiries on this matter revealed that further experimental work will be necessary before sterilisation of canned foods by irradiation can become a commercial proposition.

*Antibiotics.*—The Western Regional Laboratories of the U.S. Department of Agriculture published early in 1950 the results of

experiments on the preservation of canned vegetables with the antibiotic subtilin, a metabolic product of a certain strain of *B. subtilis*. They claimed successful preservation when subtilin (approximately 20 p.p.m.) was added to cans, and a mild process, of the order of 20 minutes at 212°F., was given. These claims were not substantiated in the laboratories of the N.C.A. and elsewhere in tests on cans artificially infected with spores of *Cl. Botulinum* and spoilage organisms. The consensus of opinion is that, at present, the method is neither sure nor safe. Nevertheless, subtilin does have a useful action, apparently inhibitory, on some bacterial spores, particularly those of flat sour organisms.

Great interest in the possible use of antibiotics in food preservation has been aroused, and the N.C.A. has initiated a programme of research to study the matter and to look for other antibiotics.

*Tenderometer.* — The tenderometer is widely used in American canneries for determining the quality and fixing the price of fresh peas purchased for canning or freezing. With any one instrument there is usually an excellent correlation between the tenderometer reading and alcohol insoluble solids (which in turn correlates highly with canning quality as determined organoleptically), but the absolute and routine calibration of tenderometers appears to be difficult.

Dr. Kramer, of the University of Maryland, is developing a shear-press which shows promise of being a useful instrument in that it may be fairly easily calibrated by means of a standard gauge. By the interchange of test cells it may be used for assessing the texture of a variety of vegetables. As at present developed it is not so convenient for routine operation as the tenderometer, but might have immediate application as a master instrument for calibrating tenderometers.

#### Recommendations

Among the recommendations made by the Team to various bodies in Great Britain are:

*To Management.* — Management should inculcate and encourage the will to work by example and by keeping everyone in the picture.

The machines, mechanical details and flow of production described in the report should be studied closely and every device to eliminate hand operations should be applied.

The movement of materials and finished goods should be reduced to a minimum; longer runs of fewer lines are advocated; standardisation of can sizes should be pursued; and scientific research should be encouraged.

*To all Ranks in the Industry.*—A greater pride in the job and a greater sense of responsibility are necessary. Modern machinery and mechanical devices to increase productivity must be accepted.

*To Food Machinery Manufacturers.*—Makers should study the types of machinery available to canners in the U.S. and make every effort to introduce into Britain faster and more efficient machines.

Special attention should be given to automatic cookers and to the designing of machines as components of complete mechanical lines rather than as individual units.

Collaboration between can makers, machinery makers, and canning firms is vital.

*To Can Manufacturers.*—Firms making cans should make every effort to ensure that improvements in American machines and technique are applied as rapidly as possible in the U.K. Higher operating speeds and steam flow closing heads would promote substantial economies in labour and space.

*To the Government.*—More tinplate and more sugar would make volume production possible. This would recreate the competitive spirit which has been lacking for so many years.

Licences to import foreign machinery of types not available in the U.K. should be granted, and foreign currency made available to purchase it.

## Research at East Malling

THE general form of the East Malling Research Station's Annual Report for its thirty-ninth year, covering the period from October 1, 1950, to September 30, 1951, remains unchanged. Part I reviews the work of the experimental farm during the season, the cropping and marketing of the fruit crop, and the spray treatments applied. Apple quality and size were good, cherries, though few, were of excellent quality, and plums and soft fruits cropped well.

A review of the research of each section appears in Part II and 36 research papers and reports are to be found in Part III. This part of the report begins with the fourth Amos Memorial Lecture, by Mr. T. Neame, entitled "Developments in Fruit Growing at Home and Abroad." It includes papers on raspberry varieties, anatomical studies of apple trees, an investigation of the effect of the time of pollination and of the influence of the pollen parent on apple fruits, statistical methods employed in field trials, the control of fruit drop, advances in analytical technique, a series of important papers on virus diseases and their vectors, the Summer Fruit Tortricid, methods employed for testing fungicides, spray damage and new selections of Golding hops, together with Dr. Massee's annual review of fruit and other pests.

Part IV contains articles on the use of continuous water sprinkling as a means of protection from spring and autumn frosts, on the pruning of maiden apple trees, and on the new organic fungicides.

## Our Contemporaries

*Articles published in the associated journals of the Leonard Hill Group this month include the following:*

"Artificial Essential Oils," by V. Vasic (*Manufacturing Chemist*).

Articles on spraying and dusting machinery, its construction and method of application (*World Crops*).

# Paper Chromatography in the Food Industry

James D. Devey, B.Sc.

**Since the pioneer work of Consden, Gordon, and Martin[1] on the separation of amino acids by paper partition chromatography, this technique has become one of the most versatile in use in biochemistry and other sciences. Its application in food science is reviewed here.**

THE basic principle of paper partition chromatography (P.P.C.) is that if a mixture of chemical compounds is applied in solution as a spot to one end of a length of filter paper, the paper dried, placed in a hanging position in a sealed vessel with the impregnated edge immersed in a trough of solvent, the solvent allowed to flow down the paper during a period of some hours, then, after drying the paper finally and spraying with a chemical reagent, the components of the mixture will usually be separated and located on the paper as coloured spots. This form of P.P.C. is known as the descending one-dimensional method.

Where the mixture of substances to be separated is complex, the two-dimensional method can be used. In this case the mixture is applied to one corner of a square sheet of filter paper and, after irrigation by one solvent, the paper is dried, turned through a right angle, and then irrigated with another solvent. In this way a fairly large number of substances can be separated as spots spread out over the square of paper.

Williams and Kirby[2] have introduced an ascending method of P.P.C. in which the paper is coiled into a cylinder which is placed end-wise in a dish of solvent with the mixture of compounds applied to the bottom edge of the paper. The solvent then rises up the paper by capillary action. The separated components can be located by a variety of chemical spraying agents, radioactive tracer techniques, bacteriological methods, and physical means, *e.g.* ultra-violet light.

The components are identified usually by means of control spots of known substances which are run simultaneously with the mixture. As references, compounds are often denoted by their $R_F$ value, which is simply the decimal part of unity expressed by the distance travelled by the substance divided by the distance travelled by the solvent. It is always important to quote all conditions of operation, as many factors such as *p*H, temperature, type of paper, solvent, and impurities all affect the $R_F$ value.

Electrophoresis, a method of separation based on movement by electrical properties, has also been carried out on filter paper.[3-9] As yet there is no unified theory which will explain all the observed phenomena occurring in paper chromatography and, up to the present, practice has outstripped theory.

### Quantitative Determinations

Very many modifications to the basic techniques have been introduced, a useful summary of which can be found in a recently published book by Balston and Talbot.[10] Many methods also exist for the quantitative determination of the separated compounds on the chromatogram (as the developed paper is called), most of these consisting of cutting out the developed spots, eluting them with a suitable solvent, and determining the quantity by means of a spectrophotometer or similar instrument. In some cases amounts of compounds as small as a few micrograms have been fairly accurately determined.

All kinds of compounds have been separated by P.P.C. including proteins, peptides, enzymes, amino acids and other nitrogenous compounds, sugars, alcohols, esters, phenols, aldehydes, ketones, acids, nucleic acid components, pigments of biological origin, resins, tannins, porphyrins, vitamins, alkaloids, antibiotics, dyestuffs, steroids and other hormones, lignins, and inorganic compounds.

### Amino Acids

Hulme[11] has studied the amino acids of the apple, and with Arthington[12] showed the presence of $\beta$-alanine and $\gamma$-aminobutyric acid in apple pulp. Using P.P.C. they further mapped the amino acid pattern of the pear, prune, apricot, and avocado. In a similar study Joslyn and Stepka[13] claimed that the avocado contained the greatest number of free amino acids in the fruits studied and that pears contained the least.

The amino acids in plant juices have been extensively studied[14, 15] and similar compounds shown in citrus juices.[16] Westall[17] has isolated $\gamma$-aminobutyric acid from the beetroot and after identifying the amino acids by P.P.C. actually recovered 50 g. of glutamine from 75 lb. of beetroot using ion-exchange resins.[18] Amino acids in molasses,[19] water extracts of flour,[20] American cheddar cheese,[21] peanuts[22], wine,[23] and other foodstuffs have been studied. The detection of added monosodium glutamate by paper chromatography[24] is of particular interest in these days of extensive use of this "flavour improver."

Recently[25] it was shown that the free amino acid pattern in potato tubers was altered by the 2,4-D treatment of the plants. By P.P.C. it was shown that the free amino acids decreased in treated samples with the exception of the amine of glutamic acid, which increased. This may be of potential significance in view of the part played by amino acids in the high temperature deterioration of dehydrated potato products.

### Sugar and Allied Industries

De Whalley and workers have made notable advances in the use of paper chromatographic methods in the sugar and allied industries[26-28] and have quantitatively

determined raffinose in sugar beet juice. Recently American workers[29] analysed the juices of lemons, oranges, and grapefruit using P.P.C. and showed sucrose, glucose, and fructose to be present as well as traces of hydrolysable glycosides containing other sugars. The simple and complex carbohydrates of wheat flour have been characterised[30-32] and the gum-like polysaccharides of barley, malt, and wort have been investigated.[33] The carbohydrates of the Jerusalem artichoke have been thoroughly investigated by Bacon and Edelman.[34]

#### Vitamin Chemistry

The use of paper chromatography techniques in the field of vitamin chemistry has been particularly well studied, and recent work in this field is worthy of attention in so far as it is of interest to food technicians. German workers[35] have been able to estimate carotene and annatto in the presence of dimethylaminoazobenzene; vitamin $B_{12}$, the cobalt-containing compound so important to animal and human nutrition, has also been studied using P.P.C.[36, 37] Vitamin A and derivatives can be separated by using alumina-impregnated filter paper[38] and the tocopherols by ordinary methods.[39] Nicotinic acid derivatives[40] and ascorbic acid analogues[41] are likewise capable of separation.

#### Other Substances

The increasing use of dehydrated foodstuffs makes the study of browning of stored products obligatory and by using the ascending method of P.P.C., Patton and Chism[42] have been able to separate ten fluorescent bands of substances from the product obtained by refluxing glycine and glucose for 100 hours. They found the fluorogens to be of maximum number after 48 hours and found successive degrees of polymerisation of the colourless precursors of brown pigments, which is in line with modern theory.

A great deal of the work leading to the identification and isolation of the toxic factor of agenised wheat flour was carried out using paper chromatographic methods[43-46] and in this case at least it must have proved invaluable as other separative and selective methods would have probably proved tedious and possibly inadequate. Metallic trace impurities[47] and synthetic food dyes[48] can also be spotted by P.P.C. Cacao fermentation[49, 50] and the catechins of tea[51, 52] have received attention recently, while Thompson[53] identified the acids and alcohols in the volatiles of Australian apples. Organic acids of beer,[54] apples,[55] and maple syrup[56] have been identified recently with possible potential importance in the processing of these items.

While the list of references to papers relating to paper chromatography could be greatly extended by incorporating references to plant, animal, and human nutrition, the foregoing will show how much has already been contributed to food chemistry by this versatile technique. As the equipment required for qualitative and even quantitative work is relatively inexpensive to erect and maintain, the invaluable help of this method should be available to every food laboratory and be of use in research, development, and quality control work.

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# News from the Industry

## FORTHCOMING EVENTS

### Twenty-first Anniversary Conference

The Purchasing Officers Association is holding its 1952 National Conference and Minibition at the Royal Hall, Harrogate, from October 2 to 5.

Four hundred delegates from all over the country will be attending the Conference, and there will be 100 exhibitors at the Minibition which is to be held in the Annexe and Promenades of the Royal Hall.

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### Nutrition Society

The Nutrition Society is holding a whole-day conference at Bedford College, London, N.W.1, on Saturday, October 18, at 10.15 a.m., on the subject of "Unusual Foods for Human Consumption."

The chairman will be Dr. R. B. Hawes, C.M.G., and the following contributions have been arranged:

Dr. W. A. P. Black: "Seaweeds and their Value in Foodstuffs."

Dr. J. Ramsbottom, O.B.E.: "Mushrooms and Toadstools."

Dr. W. S. Bristowe: "Insects as Food."

Dr. F. Aylward: "The Indigenous Foods of Central America."

Dr. H. M. Sinclair: "The Diet of Canadian Indians and Esquimeaux."

Dr. G. H. Bourne: "The Food of Australian Aborigines."

Dr. B. M. Nicol, O.B.E., T.D.: "Protein in the Diet of the Isoko Tribe of the Niger Delta."

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### The Institute of Meat

A tour to Holland, including a special visit to the International Butchery Exhibition at Utrecht, from October 26 to October 31, 1952, is to be held under the auspices of the Institute or Meat and under the leadership of Mr. S. H. Hartog, official representative of the International Exhibition. The programme is as follows:

*Sunday, October* 26.—Departure in the morning from Liverpool Street to Parkeston, thence by day boat to Hook of Holland and by train from the Hook to Amsterdam, where the party will stay during the tour. Lunch will be provided on the boat and dinner at Amsterdam.

*Monday, October* 27.—In the morning a visit to the public abattoir and cattle market, Amsterdam, under the supervision of the managing director and technical staff. After lunch a visit to several of the principal butchers' shops under the guidance of the chairman of the Amsterdam Butchers' Association. Dinner at the hotel.

*Tuesday, October* 28.—After an early breakfast the party will proceed by coach to Utrecht for an all-day visit to the International Exhibition which is being held for the first time in the Irene en Beatrix buildings. Lunch will be taken at the Exhibition. After lunch the party can either return to the Exhibition or explore the interesting town of Utrecht, which is the seat of Universities and the Veterinary College. At about tea time the party will be received by Mr. Th. Cuiper, chairman of the Exhibition and director of the Butchers' Institute. Dinner at the hotel in Amsterdam.

*Wednesday, October* 29.—An all-day visit to the famous Arnhem battlefields. Several points connected with the landing of the 1st Airborne Division will be visited. Lunch at the Hartenstein Hotel at Oosterbeek, which is opposite the monument commemorating the Battle of Arnhem. Dinner at the hotel in Amsterdam.

*Thursday, October* 30.—In the morning a motor boat tour through Amsterdam's numerous canals and harbours, returning to the hotel for lunch. The afternoon will be free for shopping and exploring the city. After dinner the party will proceed by train to the Hook of Holland, returning by night steamer (on which sleeping berths will be reserved) to England, arriving at Liverpool Street on the morning of Friday, October 31, at 9.15 a.m.

■

### Congress on Rheology

The British Society of Rheology, supported by the Joint Commission on Rheology of the International Council of Scientific Unions, is to hold the 2nd International Congress on Rheology at St. Hilda's College, Oxford, from the evening of Sunday, July 26, until the afternoon of Friday, July 31, 1953.

Papers, which must not exceed 2,000 words in length (including space for figures), will be accepted subject to referee's approval and should reach the Organising Secretary by December 1, 1952. The Proceedings will be published in book form, and, since it is intended to circulate proofs of the papers at the Congress itself, contributions cannot be guaranteed inclusion in the Proceedings if received late.

It will assist in discussion if papers are written and delivered in English. If this is not possible, French or German may be used. Contributions cannot be accepted for publication unless one of the authors is present to read the paper personally or, in case of emergency, can provide a colleague from his own laboratory who is fully competent to answer questions in the discussions. Lantern slides may be shown.

The programme will include a Presidential Address, a number of invited lectures, and a discussion on the international organisation of rheology. Speakers, other than the invited lecturers, will be strictly limited to about 15-20 minutes in presenting their papers. The exact time available will depend on the number of contributions received and, if necessary, several programmes will be run simultaneously.

The Congress will cover the whole field of the study of the deformation and flow of matter, except such specialised subjects as have come to be regarded as branches of applied mechanics, *e.g.* the classical theory of elasticity, aerodynamics.

Arrangements will be made for excursions, visits to Colleges, etc., during the Congress. The wives of rheologists are welcome.

The fee for the Congress, including available preprints, and a copy of the final Proceedings, is expected to be about £4, in English money, payable before May 1, 1953.

■

### Royal Sanitary Institute

Included in the Sessional Meetings of the Royal Sanitary Institute are the following:

Friday, October 3, 1952, at 10 a.m. in the Lady Sassoon Room, Public Library, Grace Hill, Folkestone. Papers on "Cross-Channel Port Health Control," by R. F. H. McElligott, M.B., Ch.B., Medical Officer of Health, Borough and Port of Folkestone, and "Recent Tendencies in the Adulteration and Contamination of Food," by L. H. Vale, M.S.I.A., Chief Sanitary Inspector, Borough and Port of Folkestone. Afternoon: Visit to Portland Plastics.

Benjamin Ward Richardson Lecture, Wednesday, November 12, 1952, at 2.30 p.m. at the Institute. "The Hygienic and Economic Utilisation of Offal and By-products of Food Animals," by H. E. Bywater, M.R.C.V.S., Chief Veterinary Officer, West Ham.

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### Diacetone Alcohol Cheaper

The price of diacetone alcohol, supplied by British Industrial Solvents, is to be reduced by £32 per ton. The new schedule applies to all despatches made on and after August 18, 1952, and is as follows:

| | *per ton* |
|---|---|
| 10 tons .. .. | £140 |
| 1 ton .. .. | £141 |
| 45 gallon drum .. | £142 |
| 10 gallon can .. | £162 |
| 5 gallon can .. | £172 |

All prices are carriage paid, in containers returnable at sellers' expense.

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### Erections and Extensions

Plans to carry out extensions to their factory have been prepared by The Oriental Confectionery Co., of Huntingdon.

### Annual Reports and Year Books

The seventy-sixth annual report, balance sheet, and list of donations for the year ending August, 1951, have been published by the Journeymen Bakers' and Confectioners' Pension Society.

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The work of Aslib for the year ended December, 1951, is described in the Association's recently published annual report.

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In his report in the 1951-52 year book of the Institute of Meat, the President, Mr. J. A. Brewster, M.Inst.R., M. Inst.M., described the year under review as one of considerable activity and progress. Notes are also included relating to the technical information service, the tour to Holland and Belgium, and the production and consumption of foodstuffs.

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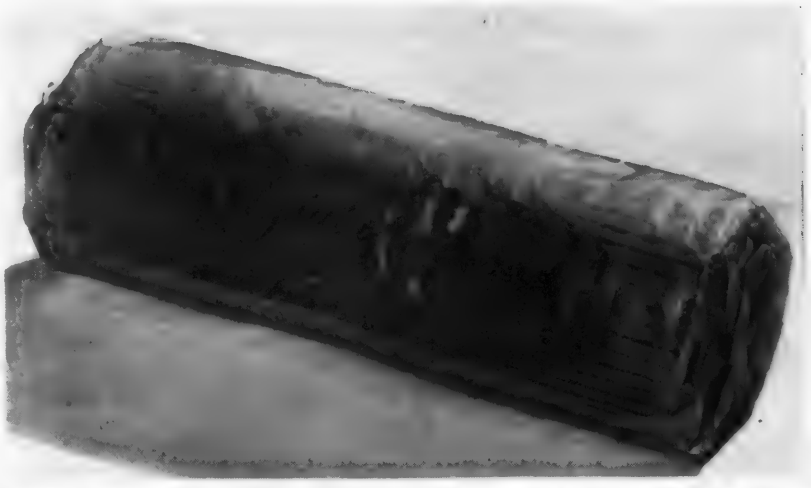
### Vitamins, Oils, Fats, and Waxes

A course of twelve lectures on the vitamins will be held in the Department of Chemistry and Biology of Acton Technical College on Wednesdays at 7.30 p.m. commencing Wednesday, October 1, 1952. The lecturer will be A. E. Bender, Ph.D., B.Sc.(Biochemistry), F.R.I.C., senior chemist, Crookes Laboratories.

The lectures will be as follows:

1. *History and Discovery of Vitamins.*—One lecture: October 1.
2. *Fat Soluble Vitamins.*—Vitamin A and its precursors, vitamin B and related compounds, vitamins E and K. Three lectures: October 8, 15, and 22.
3. *Vitamins of the B Complex and their Function.*—Oxidation and reduction reactions in the living cell. One lecture: October 29. Vitamins of the B complex. Five lectures: November 5, 12, 19, 26, and December 3.
4. *Vitamin C.*—One lecture: December 10.
5. *Some Further Applications of Vitamins in Medicine and Nutrition.*—One lecture: December 17.



The new style lightweight "fluted" diabetic loaf introduced by Procea Products. Each loaf weighs 5 oz. and is marked by ridges to enable the diabetic subject when cutting the slice to ensure a predetermined weight.

This composite course will include recent progress in knowledge of the vitamins, their nature, function, chemistry, and biochemistry, together with their application in human and animal nutrition. In Section 3, the subject matter will also include vitamins $B_1$, $B_2$, and nicotinic acid, $B_5$ pantothenic acid, choline, inositol and folic acid, biotin, vitamin $B_{12}$, the lesser known vitamins, and postulated food factors.

The course will be suitable for all industrial chemists and biochemists engaged in the food industry and in production and control of compounds of medical importance.

A course of twelve lectures on some aspects of the modern chemistry of oils, fats, and waxes will be held on Fridays, at 7.30 p.m. commencing September 26, 1952, as follows:

1. Recent Research on Oxidation of Component Fatty Acids, and Recent Progress in the Chemistry of Heavy Metal Soaps. Two lectures by J. H. Skellon, T.D., M.Sc., Ph.D., F.R.I.C., September 26 and October 3.
2. Modern Methods in the Analysis of Oils and Fats. Four lecture-demonstrations by C. Whalley, B.Sc., A.R.I.C., October 10, 17, 24, and 31.
3. Some Aspects of the Chemistry of Drying Oils. Two lectures by L. A. O'Neill, M.Sc., Ph.D., November 7 and 14.
4. Some Aspects of the Utilisation of Fats in Manufactured Foods. Two lectures by H. G. Harvey, M.Sc., A.R.I.C., November 21 and 28.
5. The Modern Chemistry of Waxes. Two lectures by L. Ivanovszky, D.Sc., F.R.I.C., M.I.Chem.E., F.Inst.Pet., December 5 and 12.

The course will be particularly suitable for industrial chemists, research workers, and others engaged in industries connected with the extraction and refining of oils and fats and waxes and their utilisation in other industries. The lecturers include research chemists and consultants who are specialists in the field indicated.

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### Power Transmission

Mechanical power transmission equipment, especially used on machine tool applications, is being displayed by J. H. Fenner and Co. at the International Machine Tool Exhibition. Both standard and the special construction V-belts, which are available in the full range of standard sizes, are on show, together with a range of taper-lock bushes and pulleys, clutches, and other power transmission products.

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### Corrigendum

On page 317 of the August issue of FOOD MANUFACTURE it was erroneously stated that the instrument for measuring the crispness of rusks was devised by Dr. W. A. Seeder of Koninklijke Verkade Fabrieken N.V. It was, in fact, devised by Mr. J. M. Klokgieters of the "Nederlandse Gist- en Spiritusfabrieken" at Delft.

The three stages in the development of Batger's Chinese Figs' pack from the original wooden drum to the more up-to-date flat box and, finally, to the new pack pictured on the left which provides greater legibility and eye appeal.

# Development in Flour Mill Conveying

## AXIAL FLOW UNITS REDUCE POWER CONSUMPTION

**Aerofoil five-stage contra-rotating fan in the pneumatic conveying system at the Westminster Mill of Hovis.** *Photo Henry Simon Ltd.*

The problems of using axial flow fans for flour mill pneumatic conveying systems have now been overcome by Henry Simon Ltd., by the introduction of high pressure contra-rotating Aerofoil fans, made by Woods of Colchester. Research work with these fans was carried out in Henry Simon's experimental mill at Cheadle Heath, Stockport, which culminated in the installation of them at the Hovis Mill, Westminster.

The capacity of the Westminster mill is 33 sacks an hour (132 tons a day). The pneumatic conveying system has 75 lifts and is divided into three separate sections in order to obtain the greatest economy in power consumption. Each of these sections has its own five-stage Aerofoil unit. The flexibility of the arrangement is illustrated by the fact that one five-stage fan has been divided into two parts; two stages of the fan are situated on one side of a 90° bend and the remaining three stages on the other. With each fan the fifth stage is used for boosting the pressure during the starting-up period or during power cuts; normally this stage is switched off and idled with a consequent saving in running cost. The three multi-stage fan units can scarcely be heard above the background sound level of the mill. Together they consume 38 h.p., whereas centrifugal fans doing the same work would have absorbed about 59 h.p., representing a saving of 35·6 per cent. in power consumption.

The contra-rotating Aerofoil fan comprises two impellers with opposite blade forms in a single cylindrical casing, one being driven clockwise and the other anti-clockwise by independent motors. This arrangement turns to advantage the air rotation which normally causes loss of pressure.

The second or downstream impeller receives the rotating air discharge from the first impeller, and as it is running in the opposite direction the relative velocity of the air over its blades is substantially increased.

The impellers are driven by Buxton-tested flameproof squirrel-cage motors which are all identical and interchangeable.

An important feature of this design is that pressures can be easily stepped up by multi-staging with standard units. Two or more contra-rotating fans can be bolted end to end to form a multi-stage unit producing a pressure equal to the sum of the individual fan pressures.

This simple form of multi-staging is particularly useful in flour mills. Apart from enabling high pressures to be obtained economically with standardised assemblies, it permits flexibility in the capacity of pneumatic conveying systems. Thus the capacity of a plant can be increased by simply adding another contra-rotating unit.

Furthermore, a simple but efficient form of regulation is inherent in the system. The volume handled by a two-stage contra-rotating fan can be reduced to about two-thirds of maximum, and the power input to about 40 per cent., by switching off and idling the first stage impeller. With units of more than two stages the regulation obtainable is quite exceptional.

Another point which recommends the Aerofoil fan for mill systems is that being inserted directly into the run of ducting it can be installed neatly in confined spaces and without the bends which the use of centrifugal fans necessitates. The general cleaning up of the layout which is thus effected reduces the system loss to a minimum, a point well illustrated by the conveying system in the Hovis Mill at Westminster.

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### Education in Pest Control

The City and Guilds of London Institute has recently announced the adoption of a new scheme for courses and examinations in pest control (non-agricultural). The scheme has been prepared by an authoritative advisory committee, including representatives nominated by the Ministry of Agriculture and Fisheries, the Industrial Pest Control Association, the Food Manufacturers' Association, the Royal Sanitary Institute, the Sanitary Inspectors' Association, dock and harbour authorities, trades unions, and representatives of technical education and the Ministry of Education.

The scheme is concerned with control of pests of importance in industry and in relation to public health, particularly those coming within the provision of the Damage by Pests Act, 1949. It does not deal with pests of growing crops. The scheme has been devised for operatives, surveyors, and technical staffs of commercial undertakings engaged in pest control, pest officers and sanitary inspectors employed by local authorities, and pest control staffs of industrial, food processing, transport, and warehousing organisations.

It is intended that in areas where a sufficient demand exists, part-time classes be set up in technical colleges in preparation for the City and Guilds examinations, which will be in two grades — Intermediate and Final. The treatment and emphasis in the Intermediate grade will be that considered appropriate for the pest control operative; the Final grade is intended for the pest control supervisor or surveyor, etc.

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### Crêpe Paper Sacks for Flour

One hundred and forty pound 4-ply crêpe paper sacks, made by Medway Paper Sacks, are to be used for Procea gluten enriched flour. In use they are easy to handle, more pliable, have no sharp edges, and stack more easily.

### Factory and Office Organisation

At the head office and works of Small Electric Motors at Eagle Works, Churchfields Road, Beckenham, Kent, are the sales and buying offices and the design and development departments.

At Hawthorn Works, Laurel Grove, Penge, London, S.E.20, the manufacture of switchgear and plating is largely carried out.

All the standard commercial D.C. and A.C. single and three phase motors are manufactured at St. John's Works, Green Lane, Penge, London, S.E.20.

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### Technical Classes in Bakery

Bakery classes began in September at all centres in the London and Home Counties' region.

Intending students are advised by the Regional Advisory Council for Higher Technical Education to aim at taking a City and Guilds of London Institute course in breadmaking and flour confectionery as this leads to a certificate which is recognised throughout the industry. The City and Guilds examinations are conducted in two stages, the Intermediate and the Final.

The Intermediate examination is normally taken at the end of a two year course which occupies two evenings a week and includes both breadmaking and flour confectionery. The examination consists of two papers, a theory paper which includes both breadmaking and flour confectionery, and a practical test which covers both subjects.

The Intermediate certificate is regarded as a craftsman's certificate, since the knowledge required is the theory of breadmaking and flour confectionery without ancillary subjects, such as science or art. The theory deals with the primary raw materials used and the simple processing of them. The practical test is one of craft ability to produce the plainer types of bakery products.

The Final course, however, is of a much higher standard and demands a further two years' study after the Intermediate certificate has been obtained. In the Final examination separate papers are set in breadmaking and flour confectionery covering theory and practice. In addition, a course of bakery science must be followed and an examination set by the City and Guilds of London Institute taken, together with the technical papers.

When the Final certificate has been obtained, those who wish to continue their technical training can take advanced courses in microbiology, flour testing and cake design, obtain endorsements to their Final certificates, and finally gain the Full Technological Certificate of the City and Guilds of London Institute.

### Advisory Service for Sausage Makers

With the object of extending their service The Oppenheimer Casing Co. (U.K.) have decided to forward to their clients a monthly news bulletin and to provide an advisory bureau to assist with the many problems now facing the manufacturers of sausage and small goods.

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### Refresher Courses for Engineers

Refresher courses for works and plant engineers initiated by the Education Committee of Incorporated Plant Engineers are to be held at Glasgow and Liverpool.

At each of these centres the course will consist of 20 lectures, given at weekly intervals by specialists drawn from industry, and each will be followed by intensive discussion.

The Glasgow courses will commence on October 15 and be held at The Engineering Centre, 351, Sauchiehall Street, Glasgow, C.2, on Wednesday evenings.

Those to be held in Liverpool will take place on Thursday evenings at Liverpool University, commencing on October 16.

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### A New Pipeline Fitting

As a result of research and experimentation to produce a pipeline fitting which would be air-tight, strong enough to withstand high pressure, and constructed in such a way that the complete joint assembly would be entirely free from crevices of any kind, hygienic, and easily dismantled and assembled without the use of tools, Clarke-Built have produced a fitting that meets all these requirements.

Further tests on this equipment have been carried out by Talbot Stead, the steel tube and fitting manufacturers, who are joining forces with Clarke-Built for the mass production of this new range of fittings.

The new sanitary pipeline fitting.

### Pelleting Press

Used in the manufacture of lemonade and other fruit tablets and cubes, coffee tablets, salt tablets, and for a wide range of similar products, the Manesty pelleting press produces tablets with a range in diameter from $\frac{3}{8}$ in. to $2\frac{1}{4}$ in. The larger tablets of $2\frac{1}{4}$ in. diameter are compressed one at a time at the rate of 16 to 32 per minute, and for the smaller sizes multiple punches and dies can be supplied so that tablets up to eight at a time can be made in one compression, or at the rate of 236 per minute.

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### Bakers' Exhibition Postponed

The Board of the Trades' Markets and Exhibitions Ltd. have come to the decision not to stage the International Bakers' and Confectioners' Exhibition again in 1953 but to wait until the autumn of 1955.

They are aware that this will cause considerable disappointment to various sections of the trade, to whom they tender their apologies, but as it is their wish to satisfy as far as possible the desires of all sections, and certainly of the majority of those who support the exhibition, they have decided on the postponement in the hope that conditions in the next year or two will improve for exhibitors and in the assurance that in any event four years is the maximum interval which the trade would wish to elapse between exhibitions.

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### OBITUARY

**Mr. W. H. White,** managing director of Quaker Oats, on August 19, after a very short illness.

Mr. White had been associated with the company for over 34 years, and was managing director since 1943.

*

**Mr. William Vernon French,** a senior director of Thames Board Mills, on August 1, after a brief illness, at the age of 57 years.

Mr. French joined the company in 1911. His ability and energy were responsible for successive appointments to the managership of Fiberite packing case, purchase, and costing departments. He was appointed a deputy director in 1932 and a director in 1939. He had been a member of the Council of the British Paper and Board Makers' Association since 1948, serving on a number of its committees and also taking an active part in the national waste paper salvage campaigns.

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### Change of Address

The address of Economic Utilities Ltd. is now 17-19, Stratford Place, London, W.1. Telephone GROsvenor 8255-9.

# A New Pack for the Margarine Industry

## VITAMINS A AND D IN ONE CONTAINER

Prior to 1952, selected fish and whale liver oils were the main source of vitamin A for margarine fortification. Crude oils were processed and delivered to Advita customers ready for use in a diluted form at a potency not exceeding 4,500 international units per g. As it was quite common for 10 lb. or more of the oil to be added to each churn of margarine, it was found most convenient and economical to adopt a relatively large pack, namely a 200 lb. heavy duty, returnable, tin-lined drum.

As natural and synthetic concentrates of a very high potency are now available, a new service and pack has been introduced to the margarine industry.

The source of vitamin A used today has an initial potency of 1·5 million international units per g. This concentration is far too high for immediate addition to the churn and so it is diluted, under controlled conditions, with a special vegetable oil to approximately one-fifteenth of its original strength. At the same time, vitamin D (calciferol) is added.

The average factory would require about 200 g. of the new material to vitaminise each batch of margarine to the advertised level. A small unit pack has been adopted which is filled with sufficient A+D concentrate to suit the churn size of the individual manufacturer and also to allow for process and storage losses. The pack consists of a 10 oz. Polytainer printed by the Masseeley process by the suppliers, Industrial Appliances. Each screw cap is secured with a film, the colour of which is the key to the net weight of the contents of the bottle.

An enquiry for a case to hold 25 bottles was made to Essex Aero, who produced a container which is hygienic, robust, light, pilfer-proof, and capable of reducing damage to the contents to an absolute minimum.

The inner crate comprises a formed sheet base, with rubber grommet inserts, tied to a lipped-hole upper nest by four special corner posts formed to fit oil-resistant rubber tubing. These four corner posts are in turn firmly attached to the rubber tubing but, being shorter, they ensure that the inner crate is fully floating within the outer case.

The filled cases are delivered by passenger train or direct road transport, and when drawn from the factory store can be taken on to the churn stage without fear of damage to the contents or the pack. The operator simply takes a bottle of concentrate from the case and, at the correct moment, empties its contents into the churn. The bottle is rinsed once with liquid oil from the blend in use and the washings are added to the churn. The empty bottle is replaced in the case, and when the 25 bottles have been used, sent back to the store for eventual despatch to the Advita works.

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### Fruit and Vegetable Research

The Fruit and Vegetable Preservation Research Station at Campden has severed connexion with the University of Bristol and is now known as the Fruit and Vegetable Canning and Quick Freezing Research Association.

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### Water Boiling Urns

A new range of water boiling urns suitable for use in catering establishments and made in 3, 6, and 10 gallon sizes has been produced by The General Electric Co.

The urns are constructed of heavy gauge copper with tinned interiors and polished copper exteriors. Water is heated by sheathed wire immersion heaters, each protected from failure caused by boiling dry by its own push button re-set safety cut-out device.

Each urn is provided with three-heat control by rotary switches. A full bore draw-off tap is fitted, together with a gauge glass, and the sheathed wire elements are easily replaceable, access to the head being obtained through removable covers.

### Malt in Food Manufacture

The experience of more than 150 years of malting combined with the facilities of a fully equipped laboratory enables Henry Page and Co. to produce malt from barley, wheat, and other cereals to suit every requirement and to advise on the type best suited to a particular use in the brewing, distilling, vinegar making, pharmaceutical, and food industries.

In addition to malthouses still worked on traditional lines the firm has maltings of the most modern type with air-conditioned working floors and oil-fired kilns to ensure the fullest control in processing. Grain for malting is stored in one of the most modern silos in the country with continuous drying plant and up-to-date mechanical handling equipment.

Malt, from barley or wheat, in the form of flour or extract, is used today in many baby foods, breakfast cereals, sugar and flour confectionery products, speciality malt flours, meals, and malt breads.

New uses for malt are being found because of its ability to modify and assist carbohydrate digestibility, confer characteristic colour and flavour, maintain moistness of crumb in cakes and bread, and give freer fermentation in breadmaking, etc. Manufacturers of vinegar, malt extracts, malt flours, biscuits, and many other products can obtain malts to any normal analysis from the company.

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### APPOINTMENTS

Mr. A. A. Morgan has been appointed a director of H. J. Heinz Company.

*

Mr. F. R. Fisher, who until recently was Works and General Production Manager, has now been appointed General Manager of the Purdy Machinery Co., whose telephone number is now EUSton 8071-2-3-4.

*

Mr. S. Beach of 14, Drygatehead, New Milns, Ayrshire, has been appointed Scottish representative of the Spicer Food Co. Mr. Beach will also be available to visit customers in the Northumberland/Durham area.

*

The appointment of Mr. J. W. Urban as Director of Overseas Relations is announced by Monsanto Chemicals.

Mr. Urban in his new duties will be responsible for personal contact with the company's agents in all countries, with Monsanto associated companies, and with other important industrial concerns in overseas markets.

*

Mr. Guy Gluckstein, grandson of the late Mr. Montague Gluckstein, one of the founders of Lyons, has been appointed a director of the company.

Mr. Gluckstein joined Lyons as an apprentice in the kitchens of the Trocadero Restaurant after coming down from Caius College, Cambridge, in 1933. Now he is responsible for the Trocadero Restaurant as well as for the Strand Corner House and for Lyons' catering service at Olympia.

*

Mr. J. A. Kind, sales manager of the Aluminium Foil Department at Venesta, has been appointed sales manager of the Packaging Division. This recently formed division, which consists of the Foil Department and the Barrel, Box, Case, and Tube Departments, is now fully engaged in co-ordinating the different packaging activities of the company.

Mr. Kind will be succeeded as sales manager of the Foil Department by Mr. P. D. Hartland-Swann. Mr. C. G. H. Cooke continues as sales manager of the Barrel, Box, Case, and Tube Department, and he and Mr. Hartland-Swann will be directly responsible to Mr. Kind.

## BOOKLETS RECEIVED

Two new publications dealing with electro-magnetic chute type separators and permanent magnetic equipment have been published by Rapid Magnetic Machines.

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A technical guide, which will be of interest to the executive, foreman, and operative concerned with tapes for Services and general export packing, has been issued by John Gosheron and Co.

•

Articles on signal generators, electronics in X-ray control, frequency deviation measurement, and high voltage discharge measurements are contained in the July issue of *Marconi Instrumentation.*

•

Uncontrolled humidity is a problem in many manufacturing processes, and three recent Birlec publications outline how some aspects of this problem can be solved by the use of Lectrodryer moisture adsorbers and Lectrofilters.

•

The leader and his role, planning the conference, the conduct of the discussion, and the use of the conference group system in a formal training programme are described in a recent booklet published by the National Institute of Industrial Psychology.

•

The B.S.I. Yearbook for 1952 (price 7s. 6d.) contains an up-to-date record of the work of the Institution and lists the British Standards current at March 31, 1952, giving a brief description of each. A list of members of the main Councils and Committees is also included.

•

The Federation of British Industries published a survey of research in British industry in 1947 and at the time it was suggested that the survey might be repeated after an interval of five years. The new publication entitled "Research and Development in British Industry" indicates that expenditure on research carried out by British industry since 1947 has increased by no less than 50 per cent.

•

The aim of the latest E.D.A. publication, "Materials Handling in Industry" (price 8s. 6d.) is to show how better materials handling can increase productivity and, at the same time, improve working conditions. It illustrates how better materials handling can be obtained by the judicious use of mechanical equipment and presents in easy reference form the wide range of mechanical handling devices in general use, together with details of their construction, characteristics, and duties.

## OBITER DICTA

• Heaven sends us good foods, but the devil sends us bad cooks.—*Gayelord Hauser.*

• There is no reason why hairdressing establishments should not issue unrationed foods.—*Major G. Lloyd-George, M.P.*

• Wipe garlic round your pan before frying an egg in it; let's have more variety in our food.—*Dr. A. Hutchison, Medical Officer of Health, Bolton.*

• If you happen to be in Bologna around Christmas time, Zia Nerina will pack some of her truffles, still buried in their wood shavings, into a sealed tin; a great prize to take home.—*Elizabeth David, "Harper's Bazaar."*

• I cannot imagine why people do not eat more kippers and herrings; I am a constant kipper eater, and if only other people would eat the same, it really would be of great assistance.—*Mr. James Stuart, Secretary of State for Scotland.*

• This unlovely fruit, the prune, we are told, is excellent when well cooked; suffice it to say that good prune-cooks must be extinct. Certainly there are none in schools, where prune-suffering is most acute.—*Mr. D. C. Fildes, in a letter to "The Spectator."*

• Anybody flying to the Continent by B.E.A. will be able to take sweets without giving up coupons. But you have to pass the Customs barrier first, and give an undertaking that you will not toss a parting bonbon to Auntie as she waves you off.—*"The Star."*

• In the course of its savoury, satisfying and perhaps distinguished career, the sausage has played a great variety of entertaining parts. Today we have to consider that delicacy in relationship to the law and decide what a statutory sausage is.—*Mr. Tudor Rees, J.P.*

• It is surprising how often Scots in the city want to celebrate, have a party, or treat visiting friends to, a Scottish meal. It may even be that Scots living in London want to prove to the Sassenachs that those over the Border do not live like savages.—*Mr. J. Adamson, food department manager of a London store.*

The different types of alimentary paste packed by Edgar Portelli of Malta, G.C., are described in a recently published booklet, available from the sole distributors for the company in the U.K., L. I. Silber and Co.

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The Second Memorandum to the Royal Commission on the Taxation of Profits and Income of the Federation of British Industries has been published and has been submitted to the Royal Commission. The Memorandum is arranged in sections which refer to the specific questions put by the Royal Commission.

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## COMPANY NEWS

All the issued share capital of Dextran has been acquired by Glaxo Laboratories.

The manufacture of Intradex, the blood plasma substitute, will continue at the Dextran factory and laboratories at Aycliffe, Co. Durham.

•

The Directors of the Beecham Group have declared a first interim dividend of 17 per cent. actual, less tax, on the deferred shares of the company, on account of the year ending March 31, 1953. This dividend is the same as the first interim dividend paid in respect of the year ended March 31, 1952.

•

The Directors of Ranks have resolved to declare a further interim dividend on the Ordinary Capital in respect of the financial year ending August 30, 1952, of 7 per cent., less income tax at 9s. 6d. in the £, payable on October 17, 1952, to holders of such capital on the Register on September 20, 1952.

•

In his address at an extraordinary general meeting of the company, Sir Graham Cunningham, chairman and managing director of the Triplex group of companies, spoke of the progress of Quickfit and Quartz.

Sir Graham said that the purpose of the meeting was to increase the company's cash reserves by £350,000. The pressure for more cash to keep up to date by purchasing new plant came substantially from the three productive subsidiary companies, namely Quickfit and Quartz, and the engineering companies of Weldall and Assembly and Stern and Bell. The turnover of these three companies had risen at an astonishing rate during the past 12 months and at the moment showed little sign of abatement.

The resolution to increase the company's capital to £830,000 by the creation of redeemable cumulative preference shares, was seconded by Lord Stanmore, vice-chairman, and carried unanimously.

# World Food News

## FORTHCOMING EVENTS

### Nutrition Research

The papers to be read at the symposium on present problems in nutrition research to be held in Basle under the auspices of the International Union of Nutritional Sciences from October 1 to 4 are as follows:

Oct. 1. "Choix des Aliments," by Dr. J. Trémolières. "The Basis of Natural Foodstuffs for Nutrition," by Prof. A. I. Virtanen. "Microbiology of Digestion with Particular Reference to Farm Animals," by Dr. D. P. Cuthbertson. "Der energetische Zusammenhang zwischen Futtermenge und Futterwirkung," by Prof. E. Crasemann.

Oct. 2. "Free and Combined Amino Acids in Foodstuffs," by Prof. E. J. Bigwood. "Wertverminderung von Eiweiss durch Erhitzen und Konservieren," by Prof. K. Lang. "Leberverfettungsverhindernde Faktoren der Nahrung," by Prof. K. Bernhard. "Futterungsversuche mit synthetischen Fettsäuren," by Prof. K. Thomas. "Beimengungen fremder Stoffe zu Lebensmitteln," by Prof. O. Högl. "Addition to Foods including Contaminations with Toxic Substances," by Prof. E. Abramson.

Oct. 3. "The Use of Hormones for Nutrition," by Dr. S. J. Folley. "Dietary Fat, Work, and Growth," by Prof. A. B. L. Beznak. "Vitamins and their Practical Significance," by Dr. L. J. Harris. "Manifestation of Vitamin E Deficiency and the Mode of Action of Vitamin E," by Prof. H. Dam.

Oct. 4. "Mineralien als Nahrungsbestandteile," by Prof. H. D. Cremer. "Le Fluor dans l'Alimentation; Mode d'action, Effet Anticarie," by Prof. V. Demole. "The Nutrition Work of FAO; Current Activities and Problems," by Dr. W. R. Aykroyd. "Research Problems of Local Foods to be used in Supplementary Feeding Schemes," by Prof. A. G. van Veen.

### Norway's Research Centre

A research centre for Norwegian industry is to be set up at Gaustad near Oslo. Robert Major, Director of the Industrial and Scientific Research Council, whose activities are largely financed from football pool profits, states that the first stage of the construction programme involves the erection of several buildings for the Central Institute of Industrial Research with a floor space of 11,000 square metres. The cost of this construction stage is put at £600,000. The Institute will provide accommodation for a number of specialised institutes in such spheres as building research, geo-technics, seaweed utilisation, textile research, and X-ray control. Another large building to be erected at Gaustad will house the paper industry's research institute with a floor space of 4,000 square metres.

### Danish Gift for Flood Victims

The Danish Canned Meat Exporters' Association and the Danish Co-operative Bacon Factories have sent one ton of canned meat, valued at about £400, as an expression of sympathy for the victims of the Lynmouth and district floods.

### Sanitation in Flour Handling

In recognition of the need for the uniform application of principles of sanitary design to bakery equipment, the leading associations and societies serving the American baking industry initiated a joint project to promulgate such standards. At a meeting held in 1949, the Baking Industry Sanitation Standards Committee was organised for this purpose, the primary object being to develop fundamental standards for the design, construction, and installation of bakery machinery and equipment.

One of these standards has now been issued in booklet form and deals with the sanitation standard for flour handling equipment.

## OVERSEAS ENQUIRIES

### Bakery and Ice Cream Equipment

McKay Agencies, 1120, Hamilton Street, Vancouver, 8, British Columbia, would be interested to hear from United Kingdom manufacturers of supplies and equipment for the bakery, confectionery, and ice cream trades.

United Kingdom firms interested in this enquiry should send full particulars of their equipment with trade literature, c.i.f. prices, etc., direct to McKay Agencies.

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### Refrigeration Plant

The Central Fisheries Department, Ministry of Food and Agriculture, Government of Pakistan, are seeking quotations from United Kingdom manufacturer for the supply of the following:

1. Deep-freeze plant for prawn (shrimp) and fish fillets, small and medium size.
2. Approximately 20 refrigerated fish cabinets of medium size (different ranges). A brine machine will also be required to run the cabinets.

Interested United Kingdom manufacturers are invited to send detailed information on their equipment and plant, together with approximate prices and delivery dates, to the United Kingdom Trade Commissioner, 1st Floor, Finlay House, McLeod Road, Karachi, Pakistan, who will forward quotations to the Central Fisheries Department.

### Sugar Institute Enlarged

A new and much enlarged building of the Institute for the Rational Production of Sugar has been opened at Bergen-op-Zoom. This will provide greater facilities for research into the culture of sugar beet.

### Combating Pilfering

In order to combat the practice of removing the contents of containers and replacing or adulterating them with an inferior product, Etablissements Remy in France are making a new device called a "Bicap," which double caps a bottle. The inner cap serves as a stopper, and the outside cap, which normally carries the manufacturer's name, is fitted over it in such a manner that it cannot be removed without being broken.

### Southern Rhodesian Beef Scheme

In view of the expected shortage of beef supplies over the next few years, the Southern Rhodesian Cold Storage Commission is ready to begin a scheme to increase production as quickly as possible. The Commission intends to provide approved farmers with breeding stock, and will advise on better farm management and breeding policy. A pilot scheme is to be started in the Mazoe Valley, a high rainfall area.

### Measuring Jam Consistency

A newly designed device for measuring the consistency of viscous materials, such as tomato products, jams, and the like, is being marketed by a Chicago firm.

The Cenco-Bostwick consistometer is used to predetermine accurate formulae for making jams and preserves of a desired consistency. Small sample batches of the product can be tested with the instrument and formula changes made in accordance with the readings.

It is constructed to form a graduated, rectangular trough divided about two inches from one end by a vertical trigger-action gate. The larger section of the trough is graduated in divisions of 0·5 cm.

In use, the smaller compartment is filled with the substance to be measured. When the gate is released, the sample flows into the graduated section and the distance it travels in one minute is noted. As the moving edge is not uniform, an average is taken of the two extremes and used to represent the mean consistency of the product. To assure uniform results, the material is maintained at a temperature of 20°C. before testing.

### Norwegian Canning School Opened

A trade school for the canning industry, costing £150,000 to build and equip, has been opened at Ledål near Stavanger, Norway. Courses at the school, which last 18 months, are designed to train workers for positions as foremen, supervisors, and production planners. The school has been built privately from funds subscribed by Norwegian canning factories.

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### Vacuum Fruit Picker

Tests on apple and orange trees have shown that a new vacuum-operated picker speeds harvesting and handles the fruit gently to avoid bruising. The picker was demonstrated at a New York State Horticultural Society show. It operates by vacuum provided by a small power unit weighing 35 lb. The head of the picker is raised by an aluminium pole, and the fruit is sucked into the conveyor tube through a flexible rubber gasket. The speed of fruit delivery is controlled by the number of turns of the tube around the pole. With extensions, the picker can operate up to 16 ft. from the ground. Above this, a hand-crank elevator or picking platform can be used. By the use of this piece of equipment the necessity for ladders is obviated.

### Australian Air-Beef Scheme

The air-beef scheme at Glenroy station in the Kimberleys has been responsible for the handling of the record number of 5,800 head of cattle during the killing season which ended on September 5.

This aerial freighting scheme had saved hundreds of carcasses that otherwise would have been wasted. The stock would have died in the Kimberleys, now gripped by the worst drought in history.

Under the scheme, the cattle are killed on the spot and the beef is taken by air from local refrigeration plant to ports.

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### Fish Meal for Human Consumption

Although fish meal is used in Britain only as an ingredient of food for animals and is highly successful when fed to cattle, pigs, and poultry, the South African Government is planning to introduce it into the nation's bread—an idea which has been received with enthusiasm by all parties of the House of Assembly.

The natives do not get enough protein, vitamins, minerals, and fats in their diet and their health suffers accordingly. To combat this, the South African Government has arranged with the bakery industry to market brown bread enriched with peanut meal, powdered skimmed milk, buttermilk powder, and calcium. This bread has been on sale in Pretoria for some time, and reports state that it was enthusiastically received. Later the intention is to introduce a small proportion of a highly purified and palatable white fish meal flour which is said to be odourless and tasteless.

Announcing this development in the House of Assembly, Dr. K. Bremer, Minister of Health, said that successful experiments at Cape Town, Pretoria, and Witwatersrand Universities had indicated that the addition of fish meal to bread and mealie meal will help to compensate for some of the deficiencies in the present-day South African diet.

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### Bread Poisoning in France

It is now considered possible that the cases of bread poisoning at Pont Saint-Esprit last year were not due to ergot poisoning, but to a product which had been incorporated in the flour to prevent it from going musty. According to experiments carried out in the Marseilles analytical laboratories, mercury was found in some of the bread, pointing to the use of preservatives, particularly an organo-mercurial compound. Tests are still being carried out.

# News from the Ministries

### Cooked Ham

It is now possible to issue to the trade cooked gammons or hams for sale to the public. These gammons or hams will be sold retail free of the ration at controlled maximum prices. It is expected that a regular supply will be maintained at least until the end of the year.

The supply of canned ham has dwindled in recent months because of the import restrictions which were imposed at the end of last year, and the new arrangement provides a welcome replacement of that loss. Steps are being taken at the same time to apply price control to canned cooked ham and bacon, whether sold in or out of the can.

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### Amendment to Flour Order

The Flour (Amendment No. 3) Order, 1952, which came into operation on August 24, further amends the Flour Order, 1952.

Under the new Order increases are made in the allowance payable to licensed flour factors and in the deductions from the prescribed delivered prices of flour sold otherwise than by retail, where delivery is taken elsewhere than at the buyer's premises; both these changes have been made necessary by a rise in the costs involved.

The charges for non-returnable cotton and hessian flour bags have been reduced because of a fall in the value of second-hand cotton and hessian bags.

A reduction has also been made in the prescribed price of semolina produced in the United Kingdom for sale otherwise than by retail and in the prescribed price of flour (other than semolina, high ratio cake flour, and imported flour) sold for export; these changes have been made because of the recent reduction in the Ministry's release price of imported wheat.

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### Soya Flour Production

The production of high fat soya flour (having a fat content exceeding 9 per cent.) by United Kingdom soya flour millers from 1945 to 1951 was as follows:

| | *Tons* |
|---|---|
| 1945 .. .. .. | 14,478 |
| 1946 .. .. .. | 8,994 |
| 1947 .. .. .. | 14,043 |
| 1948 .. .. .. | 12,387 |
| 1949 .. .. .. | 10,641 |
| 1950 .. .. .. | 5,901 |
| 1951 .. .. .. | 6,638 |

### Food Transport Order Revoked

The Food Transport Order, 1941, as amended, under which the Minister of Food might give directions with respect to the transport of food or forage, has been revoked. This Order no longer served a useful purpose since the Minister already has powers under the Defence Regulations to give such directions if they are needed.

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### Prices of Meat from Australia

Following discussions between representatives of the Australian Government and Meat Board and the United Kingdom Ministry of Food, it has been agreed that the prices to be paid for Australian mutton and lamb in the 1952-53 season shall be increased by 16·6 per cent.

This year's discussions, which began in June, were the first to take place under the 15-year Meat Agreement signed by the two Governments in October, 1951, under which changes in the Australian costs of production are taken into account.

The new price to be paid for good quality light-weight lambs will be about 1s. 3d. per lb. compared with the former price of about 1s. 1d.

# Decontrol of Coffee

## WIDER CHOICE OF BLENDS FOR CONSUMERS

From August 20, 1952, raw coffee beans may be imported under Open General Licence if originating in and consigned from the Scheduled Territories (which at present comprise the British Commonwealth [except Canada] British Trust Territories, British Protectorates and Protected States, Burma, the Irish Republic, Iraq, Iceland, and Jordan), Muscat, and Oman. Raw coffee beans may also be imported under Block Licence if originating in and consigned from any country other than Bolivia, Canada, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Mexico, Nicaragua, Panama, Philippines, United States of America and its Dependencies, and Venezuela.

The Ministry has contracts with Colonial coffee planters for the supply of about half the home needs up to 1954, and the trade is being invited to import the balance.

Existing arrangements for the import of raw coffee beans for re-export under the Bank of England ICM/UK Scheme remain in force, but as a result of the new import arrangements REX licences under the Bank of England Scheme need be used only for raw coffee beans from dollar sources.

Details of the Import Licensing arrangements have been issued in a Board of Trade Notice to Importers No. 508.

The price control on dried chicory and on coffee and coffee mixtures was also removed from August 20, 1952, and the Coffee Order, 1951, has been revoked accordingly. The Minister has asked the trade to continue to make coffee, other than speciality blends, available to the consumer within the present range of retail prices. The Minister is considering the early introduction of a statutory standard for coffee mixtures which, it is anticipated, would continue the present minimum coffee content required by the Coffee Order, 1951 (S.I. 1951, No. 860) of 51 per cent. by weight of pure coffee.

Until now the number of traders who received allocations of Ministry owned coffee has been restricted. The qualification which entitles a trader to receive such allocation is being revised. A new entrant will be required to show proof that he has imported on Open General Licence and/or Block Licence and paid duty on a minimum trading stock of 400 bags of raw coffee beans during the period November 1 to December 31, 1952, and that he is *bona fide* prepared to enter the home distribution coffee trade. He will also be required to give an undertaking not to re-export coffee received as a Ministry allocation for consumption in the United Kingdom.

Anyone proposing to become a new entrant into the home coffee trade is advised to communicate with the Ministry of Food, Coffee Division, Great Westminster House, Horseferry Road, London, S.W.1, before making commitments involving the import of raw coffee beans.

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### Danish Eggs

The Ministry of Food and the Danish Egg Export Committee have agreed that the existing egg contract which was due to expire on September 30, 1952, shall be renewed for a further year. The prices will be unchanged.

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### Purchases of Raw Sugar

From October 1, 1952, it has been decided to end the arrangement under which the Ministry of Food has hitherto purchased raw sugar used in making refined sugar and syrup exported to hard currency and certain other desirable destinations. From this date, sugar refiners will purchase and import on their own account through normal trade channels the raw sugar needed to cover their sales in these markets. The detailed arrangements for implementing this change are under discussion with the Trade Associations concerned.

### Meat and Public Health

The Public Health (Meat) (Amendment) Regulations, 1952, which came into force on August 31, gave effect to the announcement made by the Minister of Food in the House of Commons on June 16 that horse slaughterers would be required to notify authorities of their intention to slaughter.

The purpose of the amending Regulations is to put the slaughter of horses, asses, and mules for sale for human consumption on a basis similar to that of cattle, sheep, goats, and pigs. The chief requirement is that anyone intending to slaughter horses, asses, or mules must give at least three hours' notice to the local authority. Where, however, slaughter takes place at a particular place at fixed times, no individual notices are required and where immediate slaughter becomes necessary because of accidental injury, illness, or exposure to infection, notice must be given as soon as possible before or after slaughter.

Responsibility for enforcing the Public Health (Meat) Regulations remains with the local authorities. The present amendments will help them in their task of arranging for the inspection of horse meat intended for sale for human consumption. Local authorities will also be placed in a better position to execute and enforce the provisions of the Slaughter of Animals Acts which are designed to ensure that animals are slaughtered in a humane manner and without cruelty.

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### Meat Products Order

Under the Meat Products (No. 2) Order, 1952, which came into operation on June 15, 1952, the fourth and fifth schedules prescribed revised maximum prices and minimum meat contents for the specified canned meats and open pack meat products; these were due to come into force on September 14, 1952.

To enable wholesalers and retailers to dispose of their large remaining stocks of canned meats packed in accordance with existing standards, the operation of the new Schedules will be postponed until January 1, 1953.

Traders are advised to take advantage of this postponement to sell off their stocks which will become sub-standard and to take every care that future purchases comply with the new requirements. No further extension of time will be permitted.

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### Removal of Price Control

The price control has now been removed on chocolate couverture, chewing gum, and certain higher priced chocolates and sweets. The necessary amendment has been made to the Chocolate, Sugar Confectionery, and Cocoa Products Order, 1951.

Chocolate couverture is normally sold only to the trade for further processing. All chocolate couverture will still be classified according to variety by the appropriate trade association before sale, but the classification will no longer bear any reference to a maximum price.

Although chewing gum will be freed from price control, it will still require to be classified according to variety by the appropriate trade association and sold within the personal points rationing scheme.

Price control will be removed from all chocolate confectionery which is classified at retail prices exceeding 6s. per lb. and from sugar confectionery which is classified at retail prices exceeding 5s. per lb. All such chocolates and sweets will still be required to be classified according to variety by the appropriate trade association and sold within the personal points rationing scheme.

# Information and Advice

**This Service is available for subscribers to FOOD MANUFACTURE. Postal replies will be sent if a stamped, addressed envelope is enclosed with enquiries.**

### Crumpets

B.5946. *We should be glad of any information you could give us concerning the manufacture of crumpets.* (Australia)

The following formula for making crumpets should be used as a basis for trial:

| | |
|---|---|
| Flour | 60 lb. |
| Yeast | 8 oz. |
| Water at 80°F. | 24 quarts |
| Salt | 1 lb. 8 oz. |
| Baking powder | 1 lb. 4 oz. |
| Sufficient water for correct consistency. | |

All the ingredients except the baking powder and extra water are well mixed together and allowed to ferment for two hours. The baking powder is then incorporated together with extra water. Baking powder (2-1) is preferable to bicarbonate of soda, as a better colour is obtained in the finished article. It will be found necessary to take the ferment slightly on the green side, to get the best results.

### Brawn Making

B.5951. *Could you please give me a method for the manufacture of brawn?* (Ireland)

Pigs' heads, rinds, feet, and gristle can be utilised. The heads, etc., should be placed in a 60-brineometer pickle for about five days, followed by thorough cleansing in cold running water. The meat is cooked in boiling water for about one and a half hours, after which the bones are easily removed. The stock is then strained off, and the required quantity placed back in the copper, allowing about 25 per cent. in the finished brawn. The meat is put through a brawn cutter, using two of lean meat to one of fat, and added to the stock. After the seasoning has been stirred in, the brawn should be allowed to simmer for a few minutes prior to packing.

*Stock Seasoning:*

| | *Parts* |
|---|---|
| Ground white pepper | 64 |
| Ground mace | 2 |
| Ground ginger | 1½ |
| Ground nutmeg | ½ |
| Oil of lemon | q.s. |

### Vacuum Boiling of Jam

B.5954. *Could you give me details of the method used when boiling whole fruit jam in vacuum pans?* (Kent)

The fruit and juice are separated, and the juice, together with the required amount of sugar, placed into the pre-heater and heated to 160°F. It is advisable to add some citric acid at this stage. After the sugar is dissolved the mixture is drawn into the vacuum pan, and the excessive moisture evaporated at a temperature not exceeding 140° F. The concentrated syrup is transferred back to the pre-heater and the whole fruit is added. This mixture is heated to 140°F. and then drawn into the vacuum pan where it is boiled at 26 inches of vacuum. As soon as the necessary concentration is reached, the steam has to be turned off and the temperature is allowed to drop to 130°F. while the vacuum pump is kept working.

The vacuum is then slowly broken by slightly opening the bottom discharge valve. Then pectin is added and the mixture is heated up again, applying a vacuum pressure of 26 inches. After sufficient evaporation, the vacuum is broken while the stirring continues. Samples are taken and checked for soluble solids. If the solid content is higher than required, sterile water may be added; if too low, the cooking has to be continued. It is advisable to overcook slightly and to adjust the mixture by the addition of sterile water.

### The Bottling of Mussels

B.5945. *Could you provide me with a method for bottling mussels?* (Berks.)

The mussels, which must be very fresh, are thoroughly cleaned and washed in salt water. They are then steamed for about ten minutes, when the shells will open; they are afterwards emptied into suitable vessels, and the shells removed. The "beard" must be removed at this stage.

The cleaned meats are thoroughly washed and immersed from one and a half to three hours in a 3 per cent. salt solution, after which the brine is drained off and the mussels immersed for three days in a 3 per cent. solution of distilled vinegar to which has been added 3 per cent. salt. The mussels are packed in glass jars, after which the containers are filled with spiced vinegar sauce, diluted with equal parts of water. The jars are then sealed and processed. Suitable times and temperatures must be ascertained by trial, but they usually vary from about 60 minutes at 212°F. to 25 or 30 minutes at 221°F.

Non-processed pickled mussels remain in good condition from two to four months depending on the degree of skill used in preparation and on temperature of storage. The pack must be protected from light, since the meats gradually darken if light rays are too strong. Storage at temperatures from 34° to 40°F. increases the shelf life of both processed and non-processed packs.

To make the spiced vinegar sauce the following are added to 4½ quarts of 6 per cent. distilled vinegar:

| | *oz.* |
|---|---|
| Bay leaves | ½ |
| White pepper | ½ |
| Mustard seed | ½ |
| Whole cloves | ½ |
| Fennel | ½ |
| Paprika | ⅛ |

The spices are simmered, but not boiled, in the solution for 45 minutes. The spices are then strained out, the solution is filtered, and set aside to cool.

### Information Supplied

This Enquiry Service has dealt with requests for the names of manufacturers and suppliers of plant, machinery, and materials, and also general information as follows:

B.5928. *Aluminium containers.* (N. Ireland)
B.5929. *Barrier cream.* (London)
B.5930. *Labelling machines.* (London)
B.5931. *Salad dressing.* (London)
B.5932. *Licorice rods.* (London)
B.5933. *Fruit presses.* (Hunts.)
B.5934. *Shrimps and prawns.* (Ches.)
B.5935. *Citron peel in brine.* (Middx.)
B.5936. *Dehydrated vegetables* (Scotland)
B.5937. *Frozen fruit lollies.* (Isle of Wight)
B.5938. *Tomato sauce and mincemeat.* (Northumberland)
B.5939. *Ham canning.* (New Zealand)

# Recent Patents

677,487. NAAMLOOZE VENNOOTSCHAP ORGANON: Process for the preparation of pure vitamin $B_{12}$ preparations with the aid of a chromatographic method.
677,498. ELECTROLUX, LTD.: Absorption refrigerating apparatus.
678,279. MONSANTO CHEMICAL CO.: Stable emulsions.
678,290. BRITISH CELLOPHANE: Manufacture of collapsible containers from flexible wrapping materials.
678,429. BRITISH THOMSON-HOUSTON CO.: Refrigerator cabinets.
678,435. RANDLE AND SMITH: Frames for supporting chocolate moulds.
678,443. HALL, F. M., and MALCOLM, T.: Production of potato-containing foodstuffs.
678,544. CONCENTRIC MANUFACTURING CO. and BLOMFIELD, C. S.: Tools for moulding pastry in baking tins.
678,670. FLETCHER AND CO., G., and MURRAY, C. W.: Cane sugar mills.
678,696. OSTER MFG. CO., J.: Drink mixer.
678,698. JACKSON BOILERS and MUSTILL, C. W.: Storage urns of café and like sets for the preparation and storage of hot beverages.
678,763. SEVILLE, J. R.: Racks for cooling bread.
678,787. POIRAUD, E.: Metal cells for storing cereal grain.
678,880. ROBINSON AND SON, T., and FIELDEN, F.: Roller mills for cereal grain.
678,915. SUTCLIFFE, SPEAKMAN AND CO., TATE AND LYLE, and WHALLEY, H. C. S. DE: Refining agents for the treatment of sugar liquors and the like.
679,035. READS and GREGGAINS, P. K. W.: Drums and like containers.
679,046. STEPHENS, SMITH AND CO., and LISTER, G. C. B.: Machines for cutting slabs of confectionery.
679,050. WILLIAMS, H., and WILLIAMS, O. R.: Insulated fish plates.

### Abstract of a Recent Specification

### Dried Milk Powder and Milk Beverages

This invention relates to improvements in dried milk powder and in milk beverages made therefrom.

Milks of a wide range of butterfat content may be spray-dried by atomisation into a chamber through which a current of hot air flows. The product formed is almost totally soluble or uniformly dispersible in water, but reconstitutes with considerable difficulty even though such materials as sodium citrate or sodium phosphate have been added. Lump formation is avoidable only with difficulty in the absence of a high-speed mixing machine.

The method of manufacture is one which, while possessing substantially all the desirable characters of a spray-dried product yet may be easily and quickly reconstituted when mixed by ordinary methods with hot or cold water.

The invention consists in the method of preparing a readily reconstitutable dried milk powder which substantially retains the flavour of the milk or milk preparation before drying which method includes the step of intimately admixing with spray-dried milk or milk preparation a minor proportion of roller-dried milk powder.

A dried milk powder (which is readily reconstitutable and which substantially retains the flavour of the milk or milk preparation before drying) consisting in an intimate mixture of spray-dried milk or milk preparation with a minor proportion of roller-dried milk powder, is included. The proportion of roller-dried milk powder used is too small appreciably to affect the overall flavour and solubility of the mixture but is sufficient to ensure rapid penetration of water into the mass of the powder or into its particles. The rate of solution or uniform dispersion of the powder in water is thereby enhanced, and lump formation is avoided.

654,722. *Bovril Limited.*

## Trade Marks

**HERT.** — 690,903. Bread toasters. **General Stampers, Limited,** South Road Trading Estate, Bridgend, Glamorganshire; Manufacturers.
**EVENING.**—695,528. Coffee, preparations of malt and roasted plants for use as a substitute for coffee, and roasted chicory. **"Les Gourmets"** (a Joint Stock Company organised and existing under the laws of France), 52 to 58, Rue Violet, Paris (15e), France; Manufacturers and Merchants.
**G.W.P.**—699,005. Lemon curd, jelly in crystal form being an edible cake decoration, piping jelly for making edible cake decorations, powdered eggs, powdered egg whites, and powdered egg yolks with albumen. **George Walter Pickles,** trading as **Geo. W. Pickles and Company,** 12, Jordan Street, Liverpool, 1; Manufacturer.
**ALCOL.**—699,149. Homogenisers. **Alfred and Company, Limited,** 320, Ladbroke Grove, London, W.10; Manufacturers.
**LILLIPUT.**—702,709. Cheese. **Børge Hansen,** Skive Cheese Factory, Skive, Denmark; Manufacturer.
**DOME.**—703,158. Fruits and vegetables, all being preserved, canned, dried, or bottled; ham, pork brawn, luncheon meat, sausages, chicken, and herrings, all being preserved or canned foods; and edible olive oil, candied peel and mincemeat. **Compagnie Générale d'Importation, S.A.** (a Société Anonyme organised under the laws of France), 5, Rue St. Jacques, Marseille, and 52, Gresham Street, London, E.C.2; Merchants.
**TUBIX.**—703,706. Dust removing installations for use in industrial or factory premises. **Airofiltre S.A.** (a Société Anonyme organised under the laws of Switzerland), 23, Rue du Rhône, Geneva, Switzerland; Manufacturers.
**DELGANY.**—703,861. Coffee percolators, coffee pots, teapots, kettles, water jugs, and pressure-cooking saucepans, all being non-electric goods not of precious metal or coated therewith. **William Andrew Cormack,** 22, Audley Court, Pinner, Middlesex; Merchant.
**PIN PEP.**—704,466. Pepper and condiments (other than condiments for animals) containing pepper. **T. Lucas and Company, Limited,** Ruskit Mills, Moravian Road, Kingswood, Bristol; Manufacturers.
**NUALMO.**—704,969. Preparations consisting principally of cereals for use in baking and the manufacture of confectionery. **R. Atcherley and Company, Limited,** 21, Victoria Street, Liverpool, 1; Merchants.

*Recent patents and trade marks have been selected from the "Official Journal of Patents" and the "Official Trade Marks Journal" and are published by permission of the Controller of H.M.S.O.*

## New Companies

**Baked Herrings, Limited.** (508507.) Fish Quay, North Shields. To carry on business of bakers, curers, smokers, preparers, and canners of fish, etc. Nom. cap.: £250 in £1 shares. Dirs.: S. Lilburn, 33, St. George's Crescent, Whitley Bay; F. H. Brown, 10, Davison Avenue, Monkseaton; H. W. Collins, J. Hill, and I. J. Thurston.
**Park Royal Creamery, Limited.** (508537.) 33 and 34, Edmund Street, Preston, Lancs. To carry on business of manufacturers of and dealers in ice cream, cream, milk powder, etc. Nom. cap.: £25,000 in £1 shares. Dirs.: W. Cross, Red Scar, 95, Garstang Road, Fulwood, nr. Preston; J. T. Cross, 107, Liverpool Road, Penwortham, nr. Preston; A. L. Cross and Mrs. M. Cross.
**J. Denman (Paper), Limited.** (508578.) 203, Regent Street, London, W.1. To carry on business of paper merchants, manufacturers of paper bags, etc. Nom. cap.: £100 in £1 shares. Dirs.: to be appointed by subs. Subs.: Eileen M. Tew (clk.), 2, Ivanhoe Drive, Belmont, Middlesex; G. N. Lee, 23, Larkhall Rise, Clapham, London, S.W.4.
**Cambridgeshire Deep Freeze Company, Limited.** (508587.) To carry on business of refrigerators, ice makers and merchants, cold storage proprietors, etc. Nom. cap.: £20,000 in £1 shares. Dirs.: to be appointed by subs. Subs.: G. O. Vinter (co. dir.), The Manor House, Thriplow, Royston, Herts; B. H. S. Davies, Manor Farm House, Newton, Cambridge.
**Barton Meat Products, Limited.** (508637.) 79a, Ty-Mawr Road, Llandaff North. Nom. cap.: £4,000 in £1 shares. Dirs.: D. Barton and Ethel K. Barton, 21, Lon-y-Rhyd, Rhiwbina, Glam.; E. J. Gane and Enid Gane, 97, Corporation Road, Cardiff.
**Degree Manufacturing Company, Limited.** (508649.) 2, York Street, Twickenham, Middlesex. To carry on business of manufacturers and wholesalers of and dealers in chocolates, boiled, and other sweets, confectioneries, etc. Nom. cap.: £100 in £1 shares. Dirs.: S. Anysz, 57, Shirehall Park, Hendon, London, N.W.4; O. Janser, 3, Gunnersbury Crescent, Gunnersbury Park, London, W.3.
**Household Electric Appliances (South Wales), Limited.** (508659.) 117, City Road, Cardiff. To carry on business of dealers in and agents for the sale of refrigerators, etc. Nom. cap.: £3,000 in £1 shares. Dirs.: E. Nicholas, 48, Richs Road, Birchgrove, Cardiff; R. J. Nicholas, 157, Inverness Place, Cardiff; L. E. Nicholas, and Minnie M. Mountjoy.
**Sherwood Instruments, Limited.** (508700.) 286, Regents Park Road, Finchley, London, N.3. To carry on business of light engineers, manufacturers of scientific, industrial, and precision instruments, etc. Nom. cap.: £1,000 in £1 shares. Dirs.: L. Sherwood, 54, Bellamy Drive, Stanmore, Middlesex; G. J. Sherwood, 31, Durham Road, N. Harrow.
**Dan Waterman, Limited.** (508714.) 14, St. Dunstans Hill, London, E.C.3. To carry on business of butchers, sausage manufacturers, etc. Nom. cap.: £100 in £1 shares. Dirs.: D. Waterman and Mrs. R. Waterman, 19, Manor House Drive, London, N.W.6.

*From Jordan and Sons, Limited, Company Registration Agents, 116, Chancery Lane, London, W.C.2.*